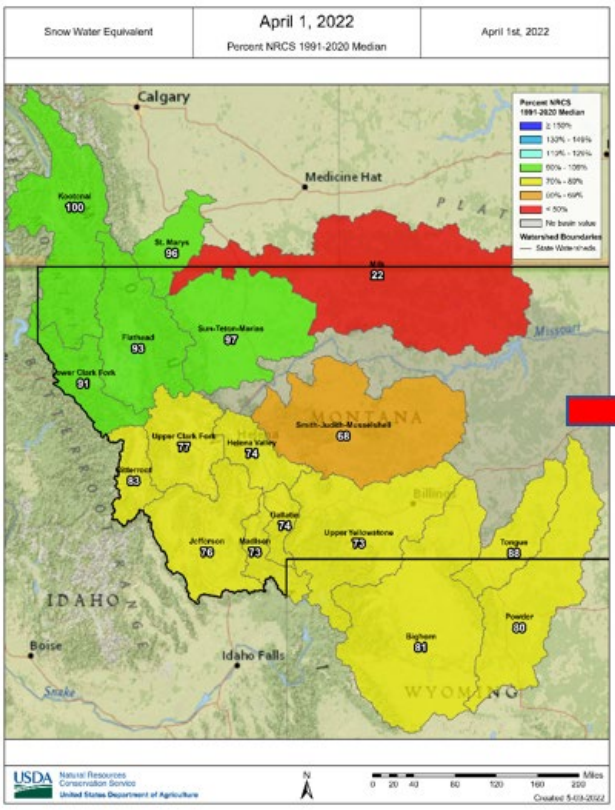
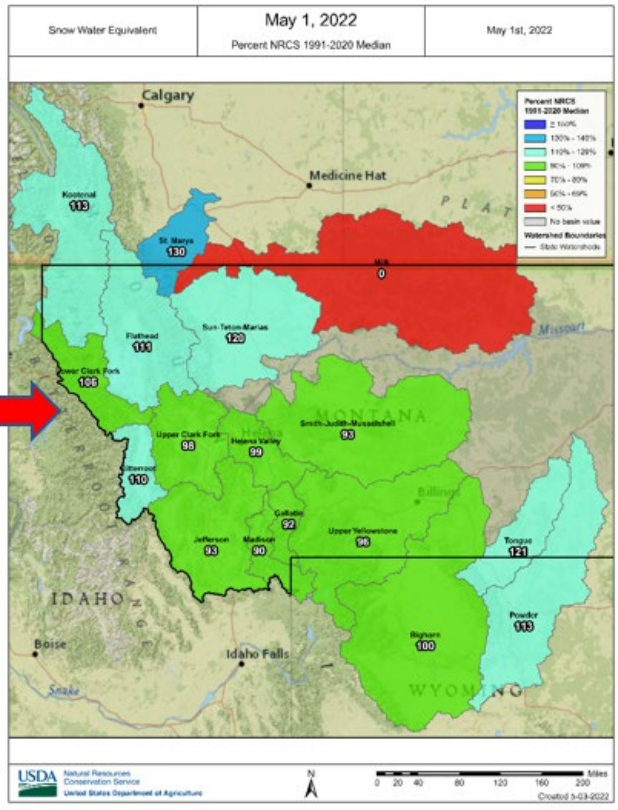
USDA
United States Department of Agriculture

Natural Resources
Conservation Service

Montana
Water Supply Outlook Report
May 1, 2022





After 3 months of below normal precipitation, wintery weather finally arrived in Montana during April. Below normal temperatures halted snowmelt and near to above normal precipitation added to the snowpack. As a result, basin wide percentages have increased since April 1. Despite improved conditions, many SNOTEL sites did not reach normal snowpack peaks this season and continued cool and wet weather is still needed to make up for the lack of snowfall from January through March.

For more water supply information, contact:

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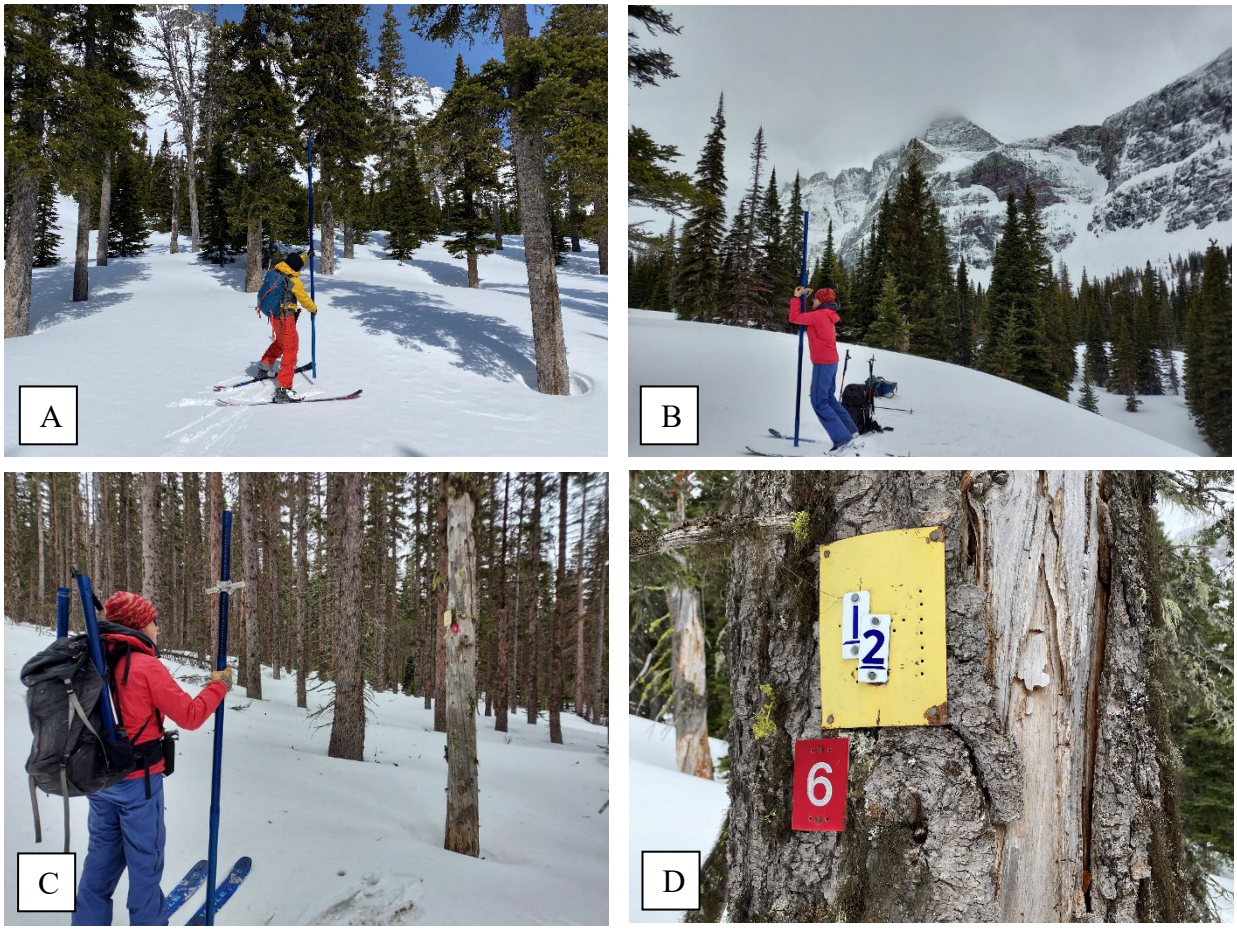
Operational News

<u>100 Years of Snow Course Measurements in Glacier National Park</u>

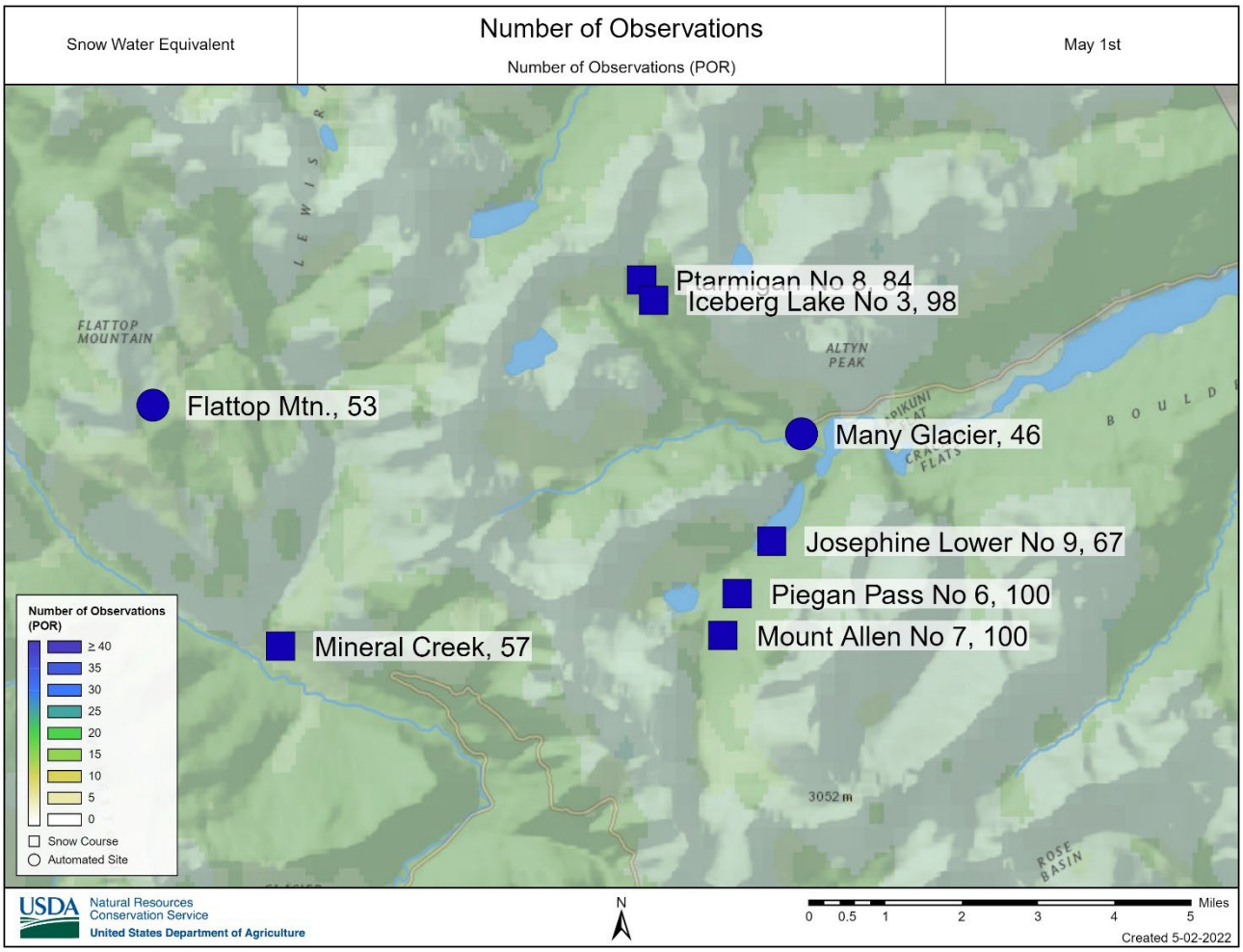
Three snow courses in Glacier National Park celebrated their 100th birthdays this month! Mount Allen No 7, Piegan Pass No 6, and Iceberg Lake No 3 snow courses were all measured for the first time in May 1922 and have been measured consistently since then. Having such a long data record makes these snow courses immensely valuable in assessing snowpack and water supply trends over time and in forecasting streamflows in the present. All three snow courses require several miles of skiing through remote terrain in variable conditions, so it is particularly impressive that surveyors have made the journey each year with only a handful of missed surveys over 100 years. Over the years many different people from different agencies have taken snow course measurements, making it a truly collaborative effort.

This year, Montana Snow Survey staff measured these three snow courses along with two others, Ptarmigan No 8 (first surveyed in 1937) and Josephine Lower No 9 (first surveyed in 1955), over two days during the last week of April. There was still abundant snow (over 120% of normal) and the only other tracks were from wildlife, including grizzly bears that had recently come out of hibernation.



Above, Montana Snow Survey staff measure Ptarmigan No 8 (Photo A), Mount Allen No 7 (Photo B), and Josephine Lower No 9 (Photo C). Sample points are marked on trees with a variety of different number plates that correspond to various iterations of the snow course sample point numbering (Photo D).

Below is a map of the snow courses and SNOTEL stations in the Many Glacier region and how many observations are recorded for May 1 across each site's period of record. Piegan Pass and Mount Allen both have 100 observations and Iceberg Lake is close behind at 98 with just a couple missed readings since 1922. Overall, the whole region has a robust data record. The shortest data record is at Many Glacier SNOTEL which was installed to replace the snow course in 1976; the snow course has been measured since 1961. These unique, valuable long-term datasets will continue to be collected in the future, assuring a complete data record for snowpack, water supply, and climate studies.



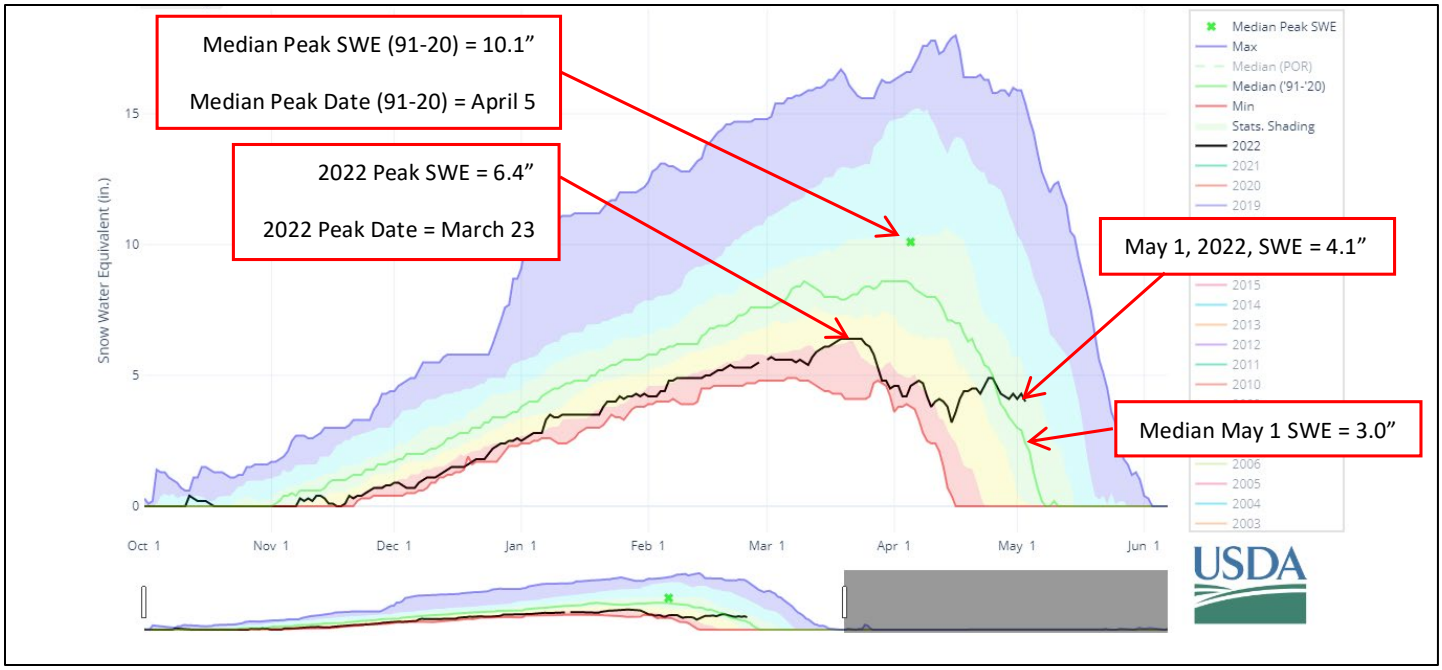
Snow Survey Product Highlight

Snowpack Peak Information

While both individual station and basin wide snowpack percent of normals are a valuable indicator of how current conditions compare to previous years, it is also important to compare snowpack peaks and timing of the peaks. This is defined as the maximum snow water equivalent reached at a SNOTEL site during a season and the day that the maximum occurs. The following snowpack peak information was recently made available on the USDA-NRCS Interactive map:

- Timing of Peak
    - Median Snowpack Peak Date (NRCS 1991-2020 Median)
    - 2022 Snowpack Peak Date
    - Difference in 2022 Snowpack Peak Date and Median Snowpack Peak Date
    - 2022 Snowpack Peak Date Compared to 1991-2020 Data (Records)
- Snow Water Equivalent Peak
    - Median Snowpack Peak (NRCS 1991-2020 Median)
    - 2022 Snow Water Equivalent Peak
    - Difference in 2020 Snowpack Peak and Median Snowpack Peak
    - 2022 Snowpack Peak Compared to 1991-2020 Data (Records)

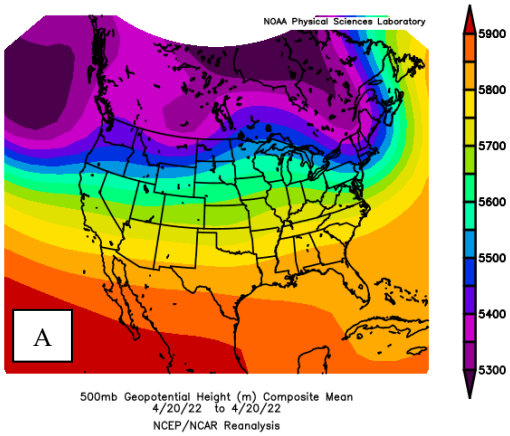
To better conceptualize peak dates and how they relate to snowpack percentages, look at the figure below showing Box Canyon SNOTEL Snow Water Equivalent for water year 2022. It had near record low conditions all

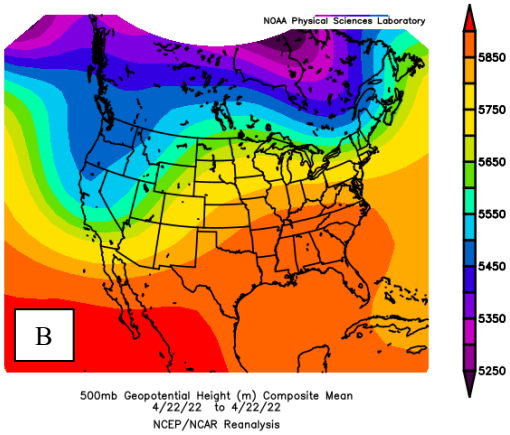


winter and the snowpack peaked at just 6.4 inches, which is 3.7 inches of snow water equivalent less than the median peak. However, on May 1 the snowpack percent of normal was 137% because normally most of the snow has melted by May 1. As a rule of thumb, be cautious when using snowpack percentages during the snowmelt period and always consider other variables such as snowpack peaks when planning for summer water supplies.

Weather and Climate

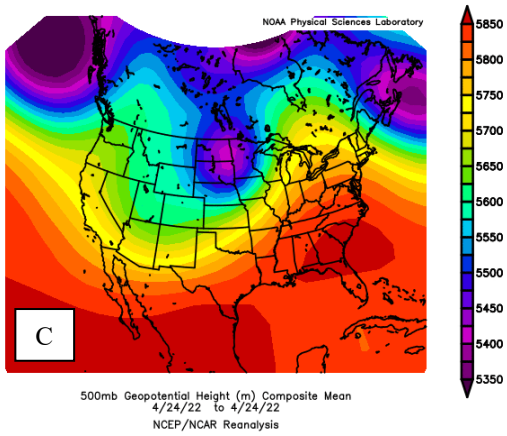
Circulation Patterns

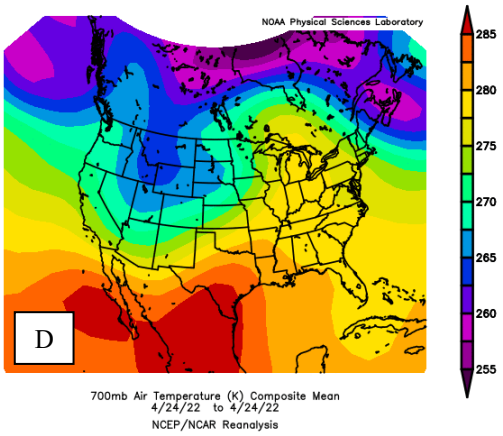




After a winter of unfavorable circulation patterns that shunted moisture away from the Rocky Mountains, April marked a significant shift. From the beginning of April to the last day of the month, the following pattern repeated. First, the northern airmass dipped south into Montana (Map A – April 20), then a finger of low pressure formed in the western US (Map B – April 22) before breaking away, and finally the cutoff low moved east across the northern US (Map C – April 24), bringing moisture with it in a counterclockwise direction and with a cold airmass moving in behind it. Over the course of the month, four separate cutoff lows passed over Montana and the northern US. This is a common spring circulation pattern, and it was especially prevalent during April, which meant that precipitation was regular enough and temperatures cool enough to continue building the snowpack in many mountain ranges.

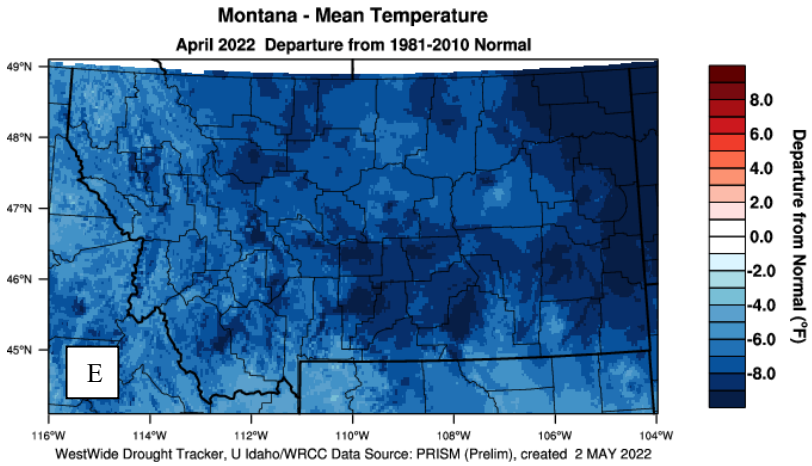
The last map (Map D) shows temperature instead of geopotential height. Maps C and D are both from April 24 and clearly show how cooler temperatures, in blue, fill in behind a passing low pressure center. In Montana, this was helpful in keeping precipitation in solid form and preserving it in the snowpack.



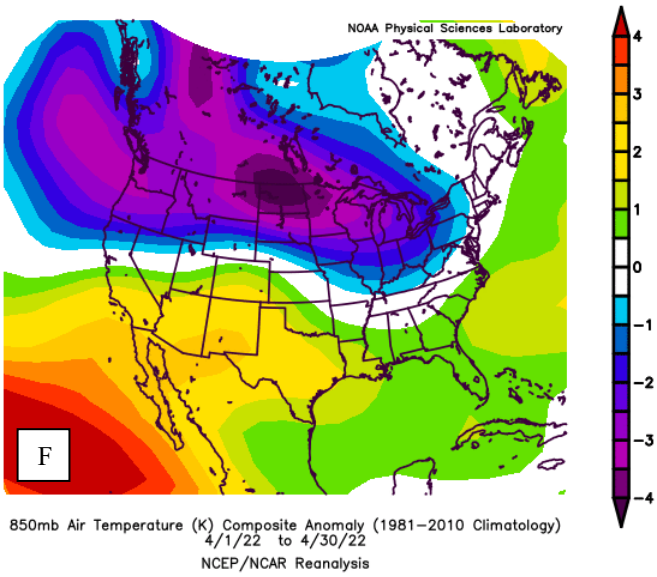


Temperature

April temperatures were exactly what was needed to hold onto and in some cases build the snowpack. Monthly average temperatures were well below normal across the entire state (E), which was very effective in preserving snowpack and preventing early runoff.



We can visualize April temperatures on a larger scale by looking at the temperature anomaly for the 850mB level, or about 5000ft of elevation (F, below). Average temperatures across Montana at that level were 2.5-4 degrees C lower than usual for the month of April, which coincided with peak snowpack and delayed the onset of melting. Most other northern US states had similar anomalies.



Precipitation

After nearly 3 months of waiting for normal winter weather, cool temperatures and precipitation finally arrived during April in Montana and the precipitation was much needed, particularly in the form of snow. Prior to April, northwest Montana had been the largest recipient of precipitation this water year. Weather patterns shifted last month and in April precipitation ranged from slightly below normal in northwest Montana to well above normal in southcentral and southeast Montana. The Missouri headwaters and mainstem received near normal precipitation during April.

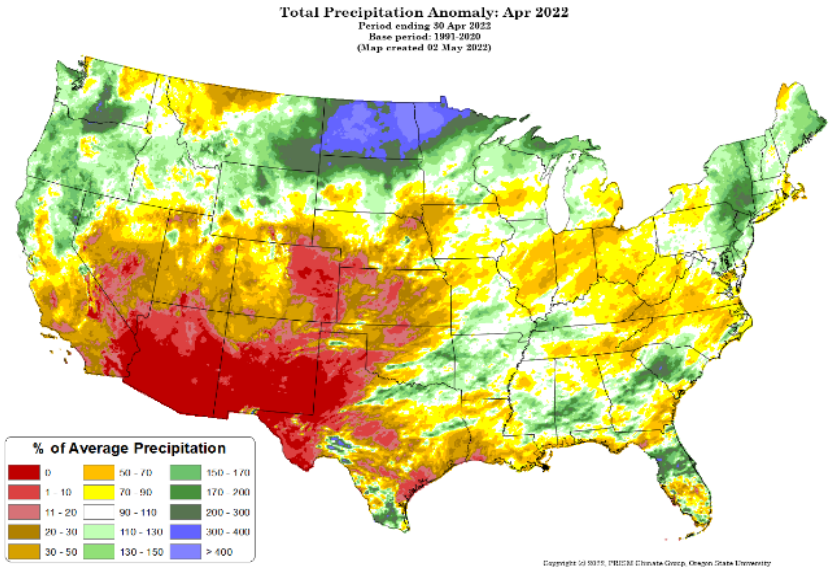


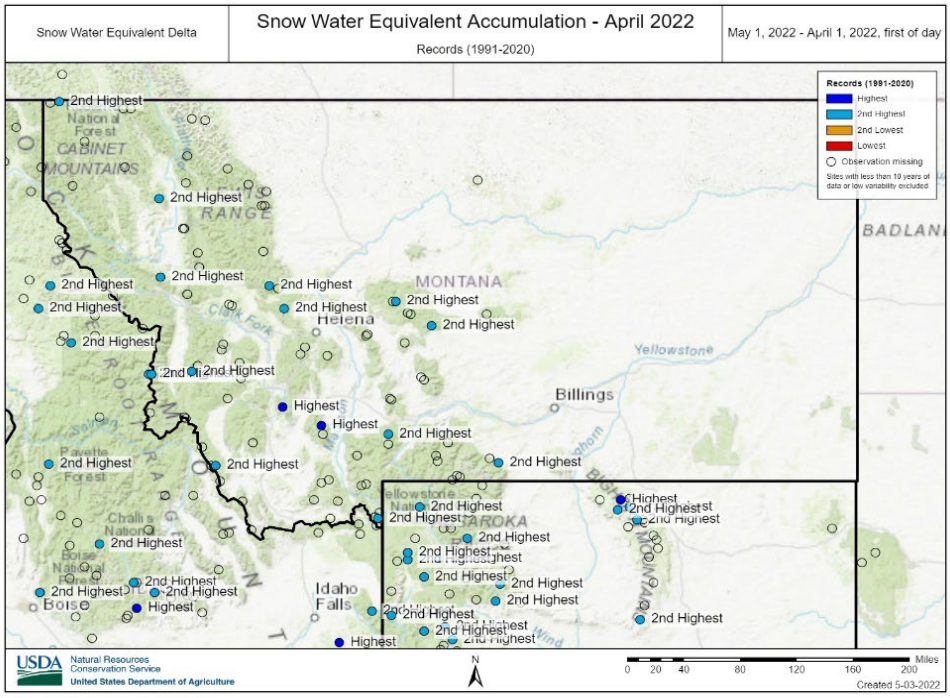
Figure 1: April 2022 Total Precipitation Anomaly. CONUS. Courtesy Prism Climate Group, Oregon State University

Temperatures were below normal during April and the mountains east of the Continental Divide received large snow water equivalent increases that broke records for the month of April at some SNOTEL sites. One station worth noting is Albro Lake SNOTEL in the Tobacco Root Mountains west of Bozeman, whose typical snow water equivalent increase for April is 0.5 inches but last month increased 6.8 inches. Part of that accumulation can be attributed to the storm that delivered 3.0 inches of snow water equivalent, or nearly 50 inches of low density snow, in 24 hours from April 11-12. Also worth noting are SNOTEL sites in and around Yellowstone National Park. One example is Two Ocean Plateau SNOTEL, which received 8.1 inches of snow water accumulation in April. That is 150% more than it received from mid-January to April 1.

Overall water year precipitation is still near to below normal across Montana, except for most northwestern Montana basins which are above normal. While the significant precipitation in April was helpful, more precipitation is needed to reach normal water year to date levels in most of Montana. December and April have contributed most of the precipitation this water year and without those two months, conditions would be very grim. As appealing as warm, sunny summer weather sounds, continued cool weather and precipitation in May would be ideal and is necessary to make up for lack of snowfall most of this winter.

Snowpack

As we near the end of this season's high elevation snowpack accumulation period, April precipitation arrived just in time and brought some recovery from the lack of early season snowfall. Cool weather and precipitation resulted in snowpack percentage increases in all of Montana's river basins from April 1 to May 1. As shown in the map below, some SNOTEL sites in Montana recorded the largest SWE increase for the month of April for their period of record.



An exception to this is the Milk River basin which doesn't have any snow remaining at the Rocky Boy SNOTEL site in the Bear Paw Mountains near Havre. Two of the largest percentage increases were the Tongue and the Powder River basins, which each increased nearly 30% since April 1 and now have an above normal snowpack. The smallest gain was the Lower Clark fork, which went from about 90% to 100% of normal. The snowpack in Montana currently ranges from below normal (80-90%) in the headwaters of the Missouri to well above normal (110-120%) in portions of northwest Montana and the northern Rocky Mountain Front. All other major basins that currently have snow are near normal (90-110%).

Snowpack percentages indicate how conditions compare to previous years for a given date, but these percentages can be misleading during early and late season. As mentioned in the Product Highlights section, Box Canyon SNOTEL south of Big Timber is a good example. It peaked at 6.4 inches of snow water equivalent on March 23, which is its lowest snowpack peak in 30 years (1991-2020). Normally by May 1 about 70% of the snow has melted at Box Canyon, but last month's cool conditions combined with precipitation delayed melt and added water to the snowpack. As of May 1, Box Canyon SNOTEL had 4.1 inches of snow water equivalent, which is 137% of normal for May 1. While that might sound promising, that location will likely have less total runoff than normal this year because it did not reach normal peak snowpack levels. This is currently the situation across most river basins east of the Continental Divide except the northern Rocky Mountain Front. Some higher elevations could potentially make gains toward normal peak levels over the next month, but most are still 2 to 3 inches of snow water equivalent below their normal peak. In general, SNOTEL sites west of the Continental Divide received more consistent snowfall this winter which resulted in reaching near normal snowpack peaks.

The best-case scenario moving forward is continued cool weather and more precipitation in locations that did not reach their typical peaks levels. Many low elevation SNOTEL sites are currently melted out while at higher elevations typical melt out dates reach as far out as late June. Continued cool, cloudy weather would assist in holding onto to the snow longer and ultimately provide water later into the typically drier summer months.

Basin-wide Snow Water Equivalent – April 1, 2022 vs. May 1, 2022

River Basin Name	April 1 SWE % Normal	May 1 SWE % Normal	SWE % Change
Bear Paw	22%	0%	-22%
Beaverhead	71%	89%	+18%
Big Hole	79%	99%	+20%
Big Horn	81%	107%	+26%
Bitterroot	83%	110%	+27%
Blackfoot	73%	96%	+23%
Boulder (Jefferson)	80%	104%	+24%
Boulder (Yellowstone)	74%	112%	+38%
Clarks Fork Yellowstone	81%	95%	+14%
Fisher	93%	118%	+25%
Flathead Lake	87%	109%	+22%
Flint	82%	96%	+14%
Gallatin ab Gateway	80%	93%	+13%
Greybull-Wood	76%	114%	+38%
Helena Valley	74%	99%	+25%
Judith	67%	98%	+31%
Kootenai in Canada	108%	116%	+8%
Kootenai in Montana	101%	112%	+11%
Little Bitterroot	70%	148%	+78%
Lower Clark Fork	91%	106%	+15%
Madison ab Hebgen	69%	82%	+13%
Madison bw Hebgen	75%	91%	+16%
Marias	97%	117%	+20%
Middle Fork Flathead	98%	126%	+28%
Musselshell	69%	94%	+25%
North Fork Flathead	100%	119%	+19%
Northern Gallatin	67%	91%	+24%
Owl	98%	200%	+102%
Powder	80%	113%	+33%
Rock (Clark Fork)	82%	100%	+18%
Rock (Yellowstone)	72%	106%	+34%
Ruby	72%	79%	+7%
Shields	49%	66%	+17%
Shoshone	74%	91%	+17%
Smith	72%	92%	+20%
South Fork Flathead	86%	93%	+7%
Southern Flathead	95%	107%	+12%
St. Marys	96%	130%	+34%
Stillwater (Flathead)	96%	124%	+28%
Stillwater (Yellowstone)	78%	98%	+20%
Sun	96%	126%	+30%
Swan	92%	98%	+6%
Teton	98%	121%	+23%
Tongue	88%	121%	+33%
Upper Clark	80%	101%	+21%
Wind	84%	99%	+15%
Yaak	91%	114%	+23%
Yellowstone ab Livingston	75%	95%	+20%

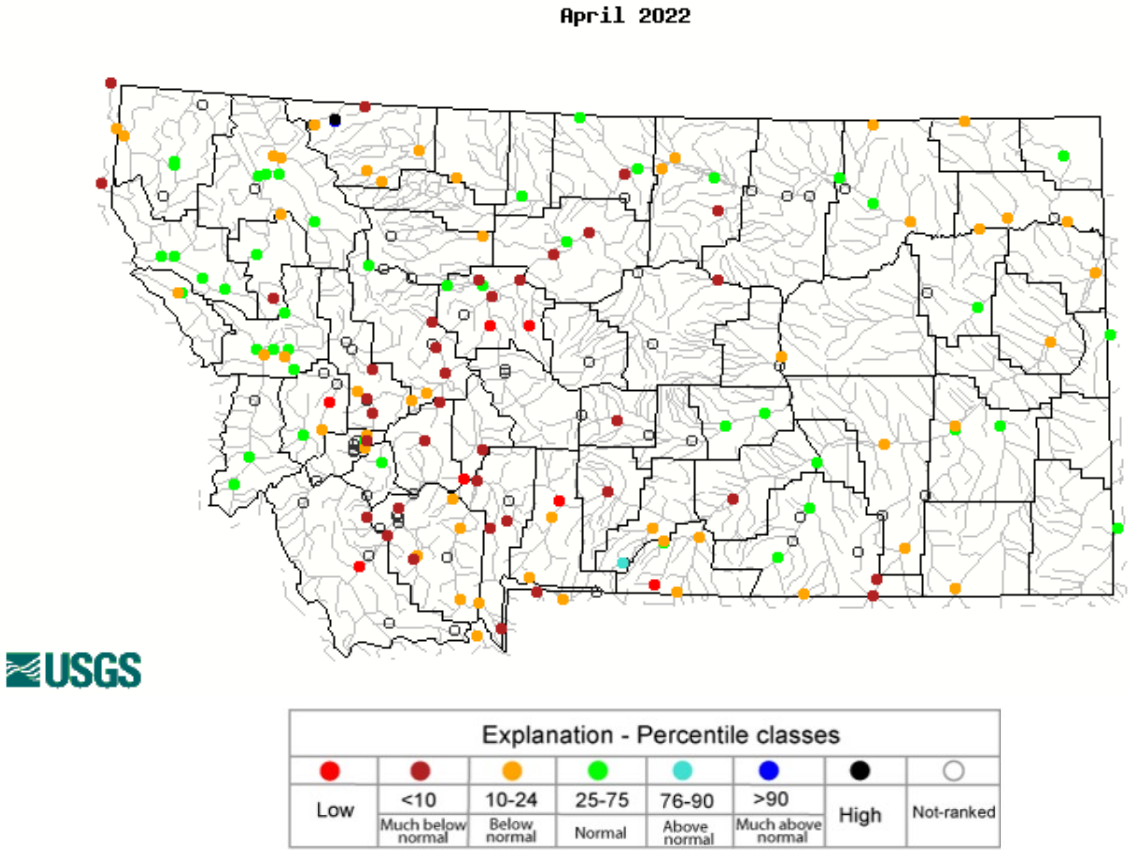
Reservoirs

End of April reservoir storage levels range from well below normal to well above normal. Lake Sherburne, Gibson, Nilan, Bair, Deadman's Basin, Lima, Nelson, and Fresno reservoirs are at the lower end of that range (50-70%). Cooney, Tongue River Reservoir, and Lake Como are all above normal (110-120%). Mystic Lake is well above normal at 193%. In general, reservoir levels are higher than last month and lower than last year at this time.

Current Streamflows

April is typically the beginning of the runoff season in Montana as temperatures warm and the higher elevation snowpack begins to phase into melt. This was not the case this year. Well below normal temperatures across the state slowed melt at higher elevations and the cool temperatures paired with consistent moisture added significantly to the mountain snowpack in all major river basins.

This delay in snowmelt is reflected in the streamflows reported for April. Nearly all gages in the southwest, central, and south-central portions of the state had below normal to well below normal streamflow this past month. Many gages also reported record low flows for the month as indicated by the red dots on the map below. In the northwest region of the state many sub basins began to see significant snowmelt during the last week of April and many streams in the Kootenai, Flathead, Lower Clark Fork, and Bitterroot basins observed flows closer to normal for this time of year.



Drought Information

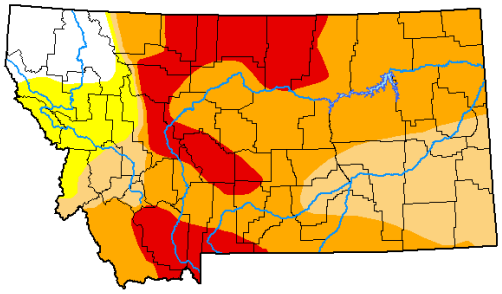
The most recent National Drought Monitor map, released on May 5, 2022, shows 85% of the state of Montana in some category of drought designation.

Montana saw ample moisture this past month in the form of rain and snow in the mountains and valleys. This beneficial moisture has improved drought designations across the state. In early April (see the map below) over half (52%) of the state was experiencing extreme, D3, drought conditions. Currently there are just a few counties in north central and southwest Montana still categorized as D3 or 19% of the state.

Hopefully the wet weather patterns continue into May and June and bring much needed rain to eastern Montana which is experiencing a long term drought that began over 2 years ago.

U.S. Drought Monitor

Montana



May 3, 2022

(Released Thursday, May. 5, 2022)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	6.93	93.07	85.40	65.54	19.06	0.00
Last Week *04-26-2022*	9.48	90.52	85.40	77.19	39.25	0.00
3 Months Ago *02-01-2022*	8.15	91.85	89.22	85.89	45.54	7.64
Start of Calendar Year *01-04-2022*	7.36	92.64	89.33	86.35	53.93	13.87
Start of Water Year *09-28-2021*	0.00	100.00	100.00	100.00	65.68	21.91
One Year Ago *05-04-2021*	12.37	87.63	64.36	33.97	15.71	0.00

Intensity:

None
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

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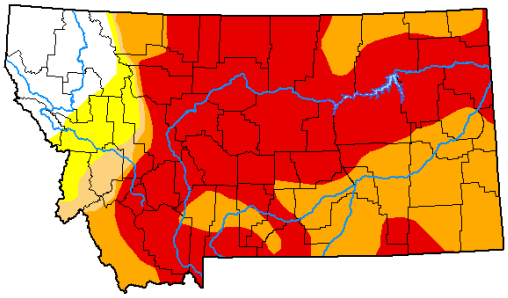
droughtmonitor.unl.edu

U.S. Drought Monitor

Montana



April 5, 2022

(Released Thursday, Apr. 7, 2022)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	9.38	90.62	85.32	82.52	52.44	0.00
Last Week *03-29-2022*	12.65	87.35	85.32	82.52	52.44	0.00
3 Months Ago *01-04-2022*	7.36	92.64	89.33	86.35	53.93	13.87
Start of Calendar Year *01-04-2022*	7.36	92.64	89.33	86.35	53.93	13.87
Start of Water Year *09-28-2021*	0.00	100.00	100.00	100.00	65.68	21.91
One Year Ago *04-06-2021*	16.52	83.48	43.51	18.06	5.60	0.00

Intensity:

None
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
Deborah Bathke
National Drought Mitigation Center

droughtmonitor.unl.edu

If you would like more information about current drought conditions or require assistance due to drought, the links below can help you gather information and assist you in getting in touch with the appropriate agencies.

Drought Links:

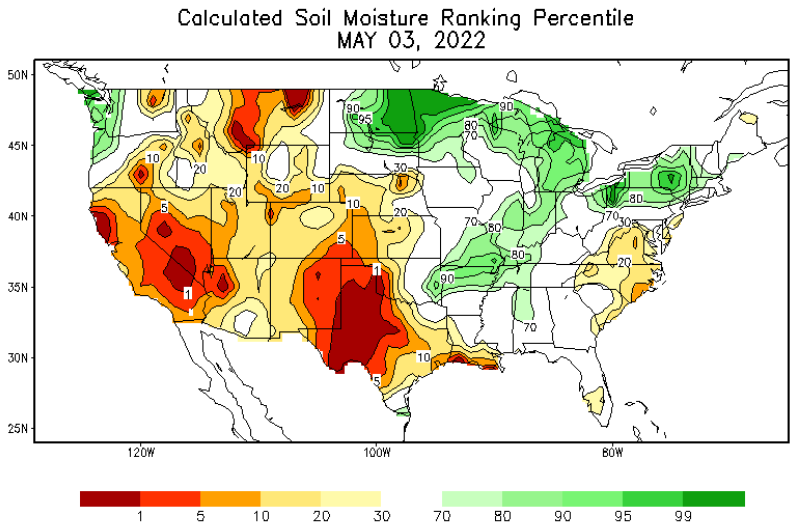
- U.S. Drought Monitor
- National Integrated Drought Information System
- USDA Drought Portal (News and Resources)
- Farm Services Agency Montana News Releases (Information on Programs and Deadlines)
- Farm Services Agency Disaster Assistance Programs
- Montana Department of Natural Resources and Conservation Drought Management

Soil Moisture

Modeled soil moisture for May 3, 2022, indicates that despite beneficial rain and snow in April, soils are still at or below the 30th percentile for moisture content across most of the state.

The largest deficits remain in southwest Montana extending up through central Montana and in the northeast corner of the state.

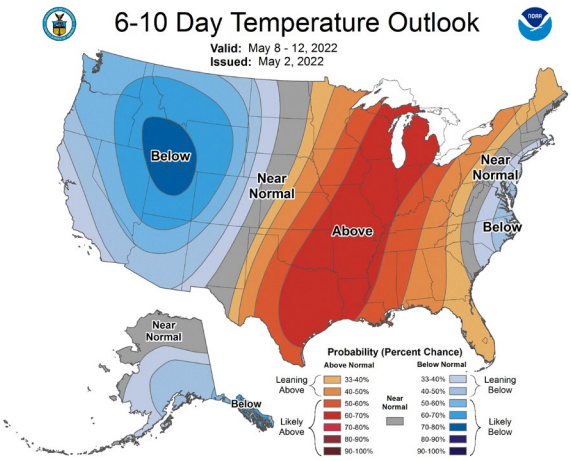
This demonstrates how dry soils were going into this spring and how even above normal precipitaiton in April was not enough to overcome deficits that have been in place since last spring. We will need to continue to see moisture throughout the next few months in order to start to recover soil moisture deficits.

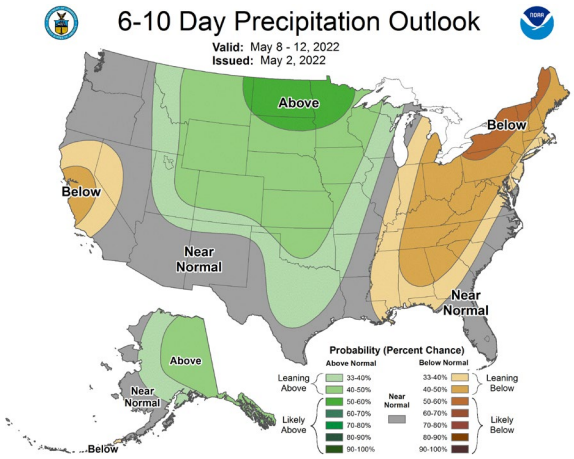


Weather and Climate Predictions

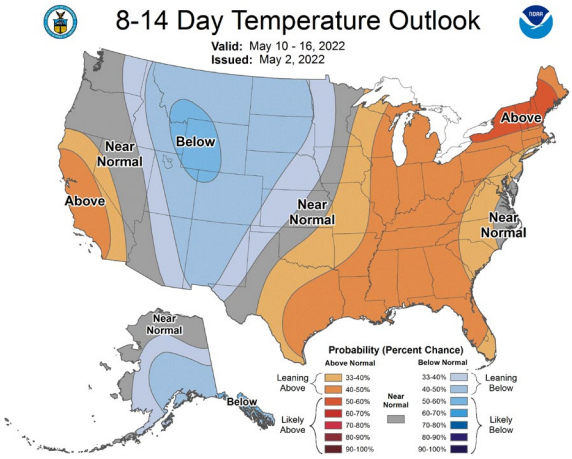
According to NOAA's Climate Prediction Center, April's cool and showery weather pattern looks to continue. The immediate future has increased chances of being cooler than normal with above normal precipitation for the next week or two. Both the 6-10 day outlook and the 8-14 day outlook show increased chances of below normal temperatures. The models are in less agreement about precipitation, with the 6-10 day outlook showing slightly increased chances of above normal precipitation and the 8-14 day outlook showing mostly near normal, with far west and southwest Montana having a slightly increased chance of below normal precipitation.

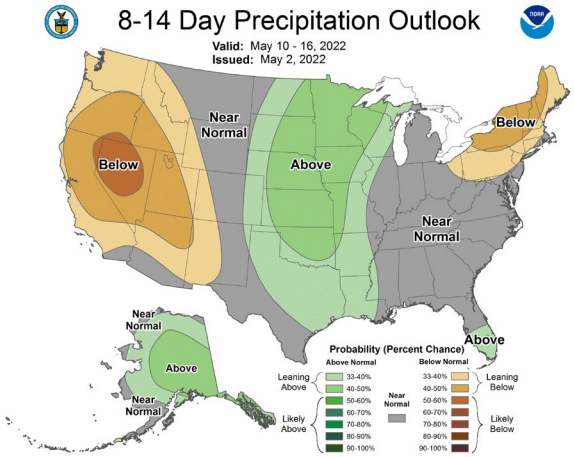
6-10 Day Outlook





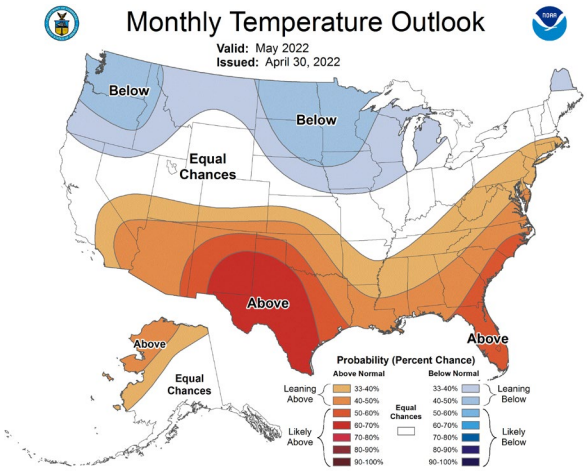
8-14 Day Outlook

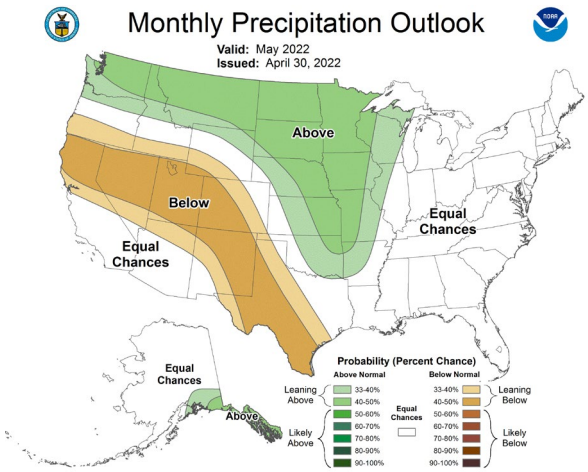




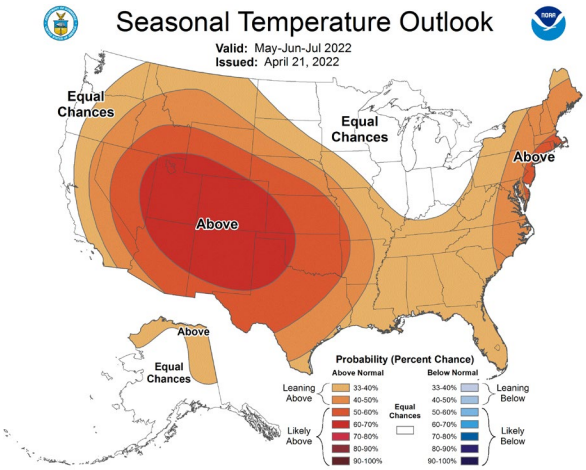
Continuing the short term patterns, the monthly outlooks for May show increased chances of below normal temperatures and above normal precipitation, which would be helpful in slowing runoff and preserving water supplies for later in the summer. The three month outlook diverges from this pattern and calls for increased chances of above normal temperatures and below normal precipitation, which could mean a hot, dry summer. It is important to remember that these outlooks are an expression of probability and not a guarantee of particular conditions.

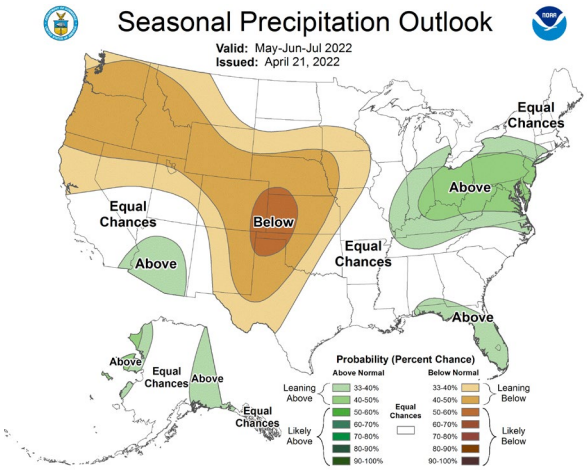
One Month Outlook





Three Month Outlook





Official Streamflow Forecasts

How Forecasts Are Made

Most of the annual streamflow in the Western United States originates as snowfall that has accumulated high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are combined with snowpack data to prepare runoff forecasts.

Snowpack measurements are obtained by using a combination of manual and automated SNOTEL measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. At automated stations, snow depth and snow water equivalent as well as precipitation and temperature are monitored on a daily basis. Both monthly and daily data are used to project snowmelt runoff.

Forecast uncertainty originates from two sources: (1) uncertainty of future hydrologic and climatic conditions, and (2) error in the forecasting procedure. To express the uncertainty in the most probable forecast, four additional forecasts are provided. The actual streamflow can be expected to exceed the most probable forecast 50% of the time. Similarly, the actual streamflow volume can be expected to exceed the 90% forecast volume 90% of the time. The same is true for the 70%, 30%, and 10% forecasts. Generally, the 90% and 70% forecasts reflect drier than normal hydrologic and climatic conditions in the coming months; the 30% and 10% forecasts reflect wetter than normal conditions. As the forecast season progresses, a greater portion of the future hydrologic and climatic uncertainty will become known and the additional forecasts will move closer to the most probable forecasts.

Summary

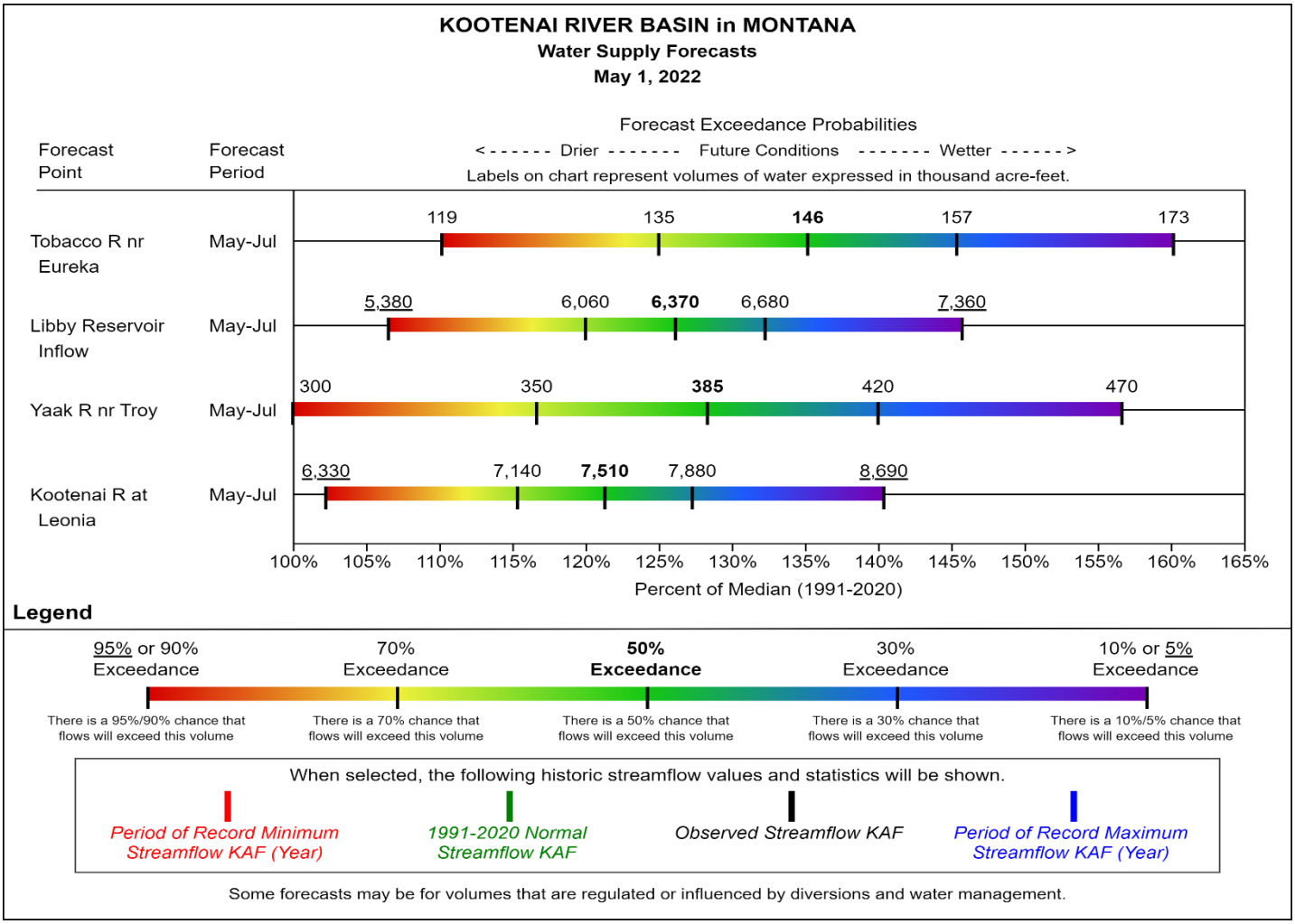
Our hail Mary wishes for cool temperatures and beneficial spring precipitation were answered this past month. Below normal temperatures not only aided the mountains in retaining snow but allowed moisture moving through to fall as snow at all elevations; adding to existing snowpacks up high and helping replenish soil moisture down low. Current streamflow forecasts for the May to July time period reflect improved snowpack and precipitation conditions.

Along the Rocky Mountain Front and in the river basins west of the Continental Divide, April precipitation was not as bountiful as in other regions, but the snowpack remains above normal and has yet to begin melting at the upper elevations. Streamflow forecasts are near to above normal in most of these river basins. The exceptions are the forecasts for the Clark Fork near Gold Creek and Nevada Creek. This area received beneficial precipitation last month but had deficits that were greater than surrounding areas going into April.

Forecasts for southwest Montana, the mainstem of the Missouri, and the Yellowstone are looking much less grim than last month but remain below normal for May to July. Of particular concern are the Shields and Musselshell Rivers which are forecast to be in the 40 to 55% of normal range for that period.

The best case scenario moving forward is to continue to see moisture across the state in May and June and for temperatures to increase slowly allowing snowmelt to progress gradually and sustain runoff throughout the spring and summer.

Forecast Charts



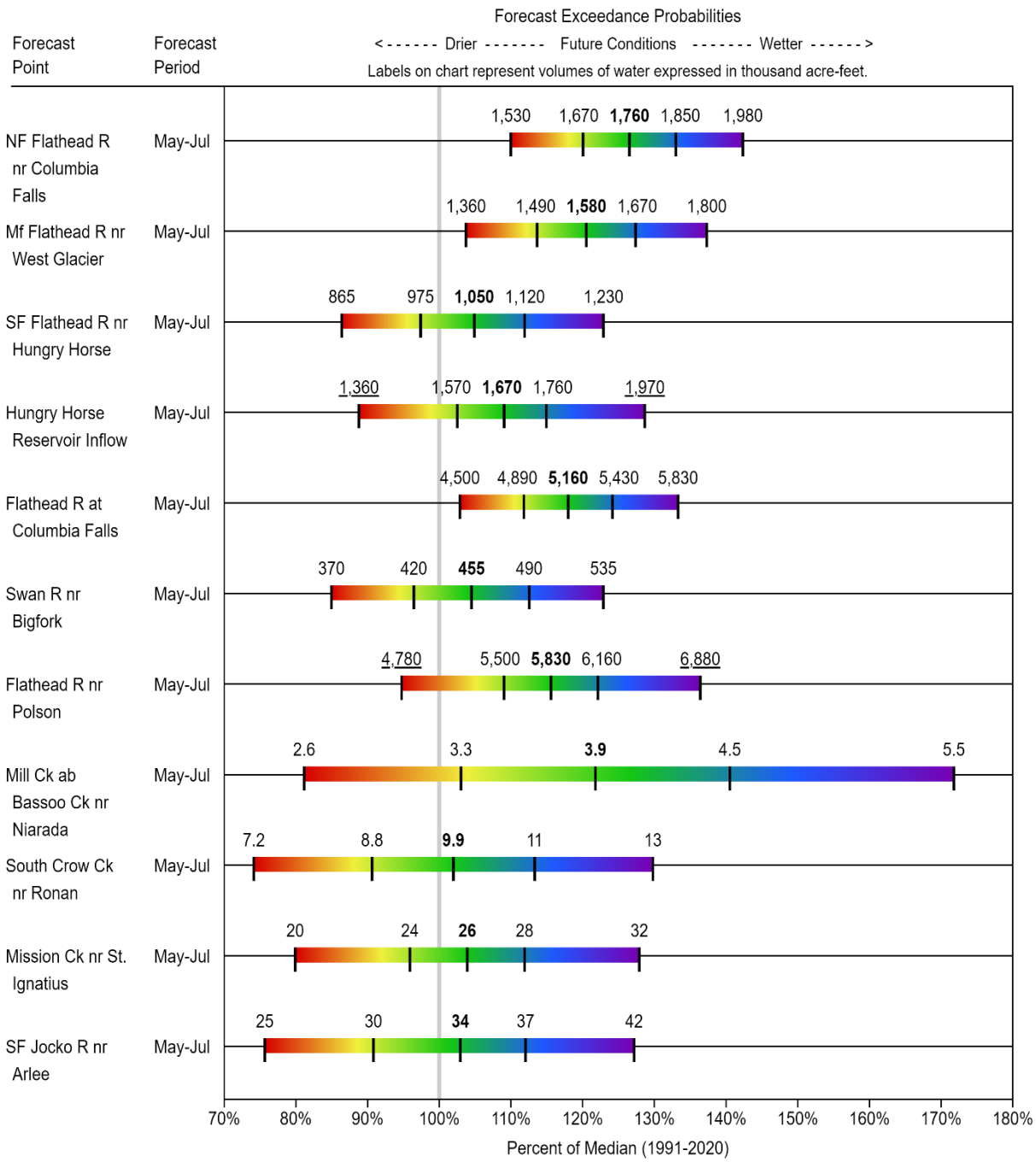
Legend

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

FLATHEAD RIVER BASIN

Water Supply Forecasts

May 1, 2022



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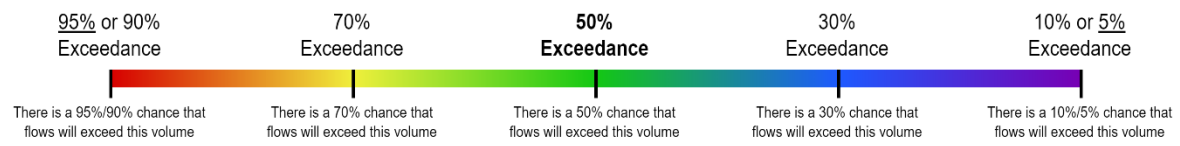


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

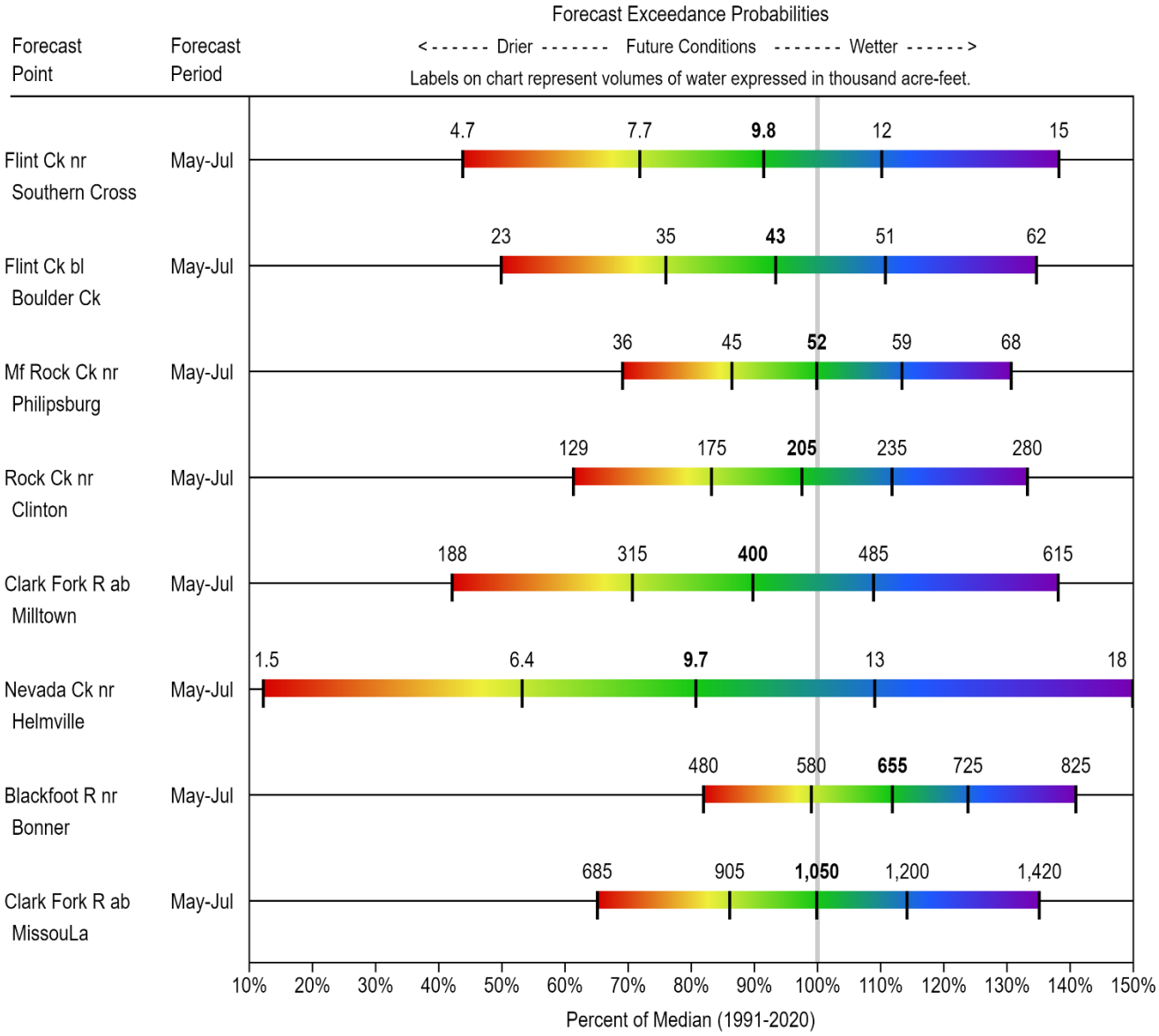
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

UPPER CLARK FORK RIVER BASIN

Water Supply Forecasts

May 1, 2022



Legend

95% or 90% Exceedance	70% Exceedance	**50% Exceedance**	30% Exceedance	10% or 5% Exceedance
There is a 95%/90% chance that flows will exceed this volume	There is a 70% chance that flows will exceed this volume	There is a 50% chance that flows will exceed this volume	There is a 30% chance that flows will exceed this volume	There is a 10%/5% chance that flows will exceed this volume

When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)	*1991-2020 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

BITTERROOT RIVER BASIN

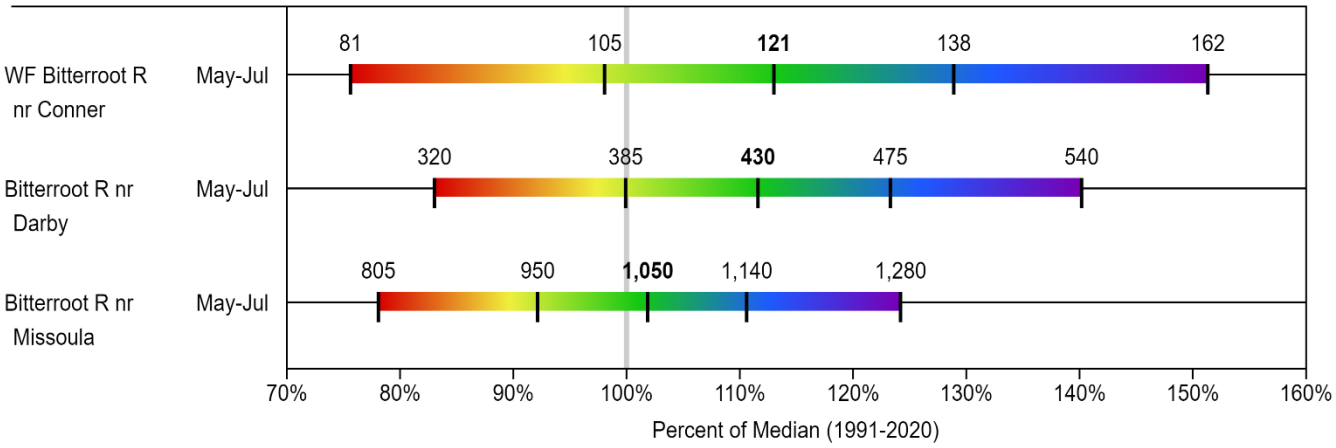
Water Supply Forecasts

May 1, 2022

Forecast Exceedance Probabilities

< - - - - - - Drier - - - - - - - Future Conditions - - - - - - - Wetter - - - - - - >

Labels on chart represent volumes of water expressed in thousand acre-feet.



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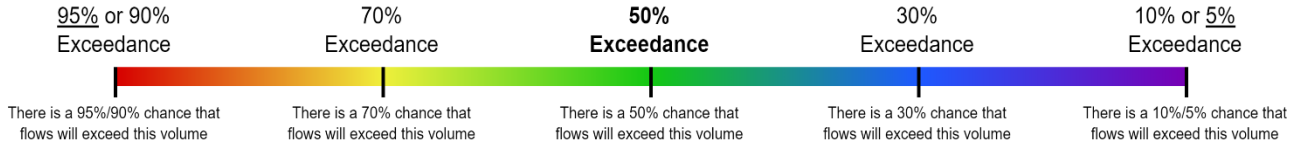

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Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

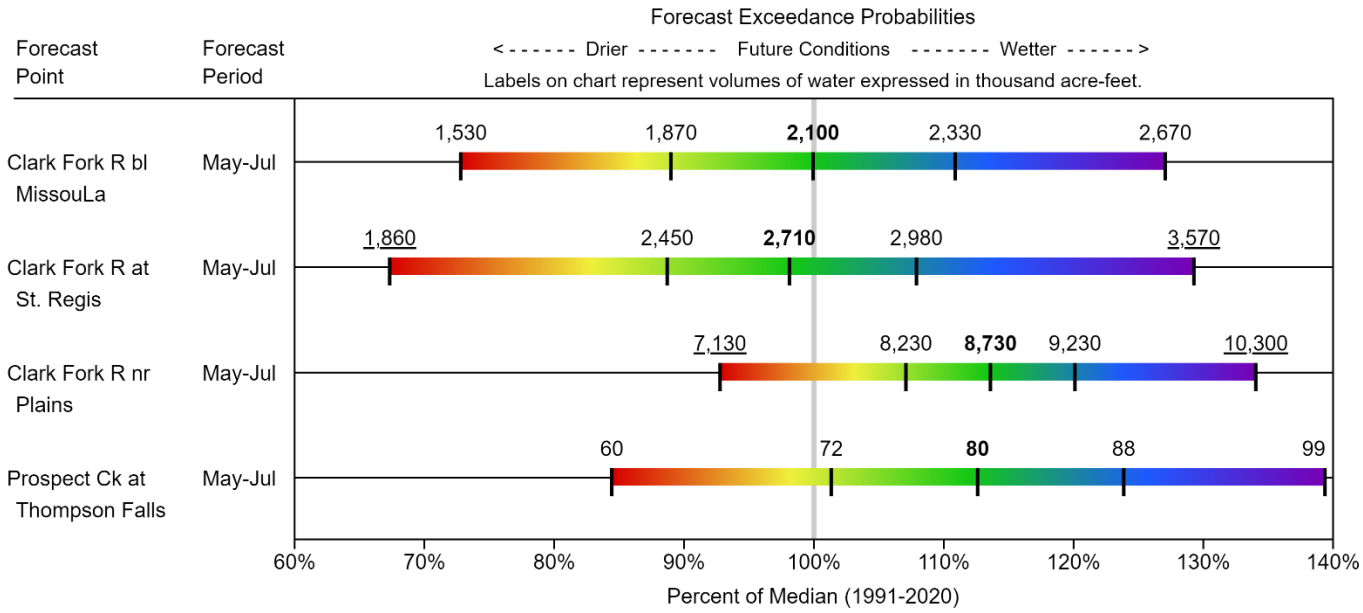
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

LOWER CLARK FORK RIVER BASIN

Water Supply Forecasts

May 1, 2022



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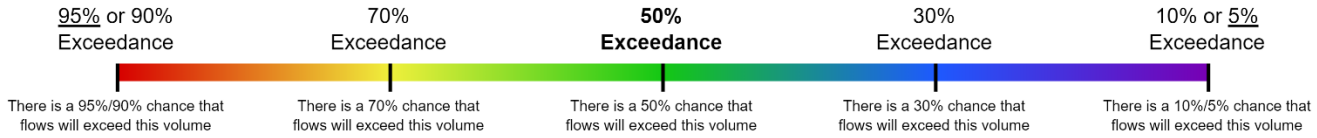


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

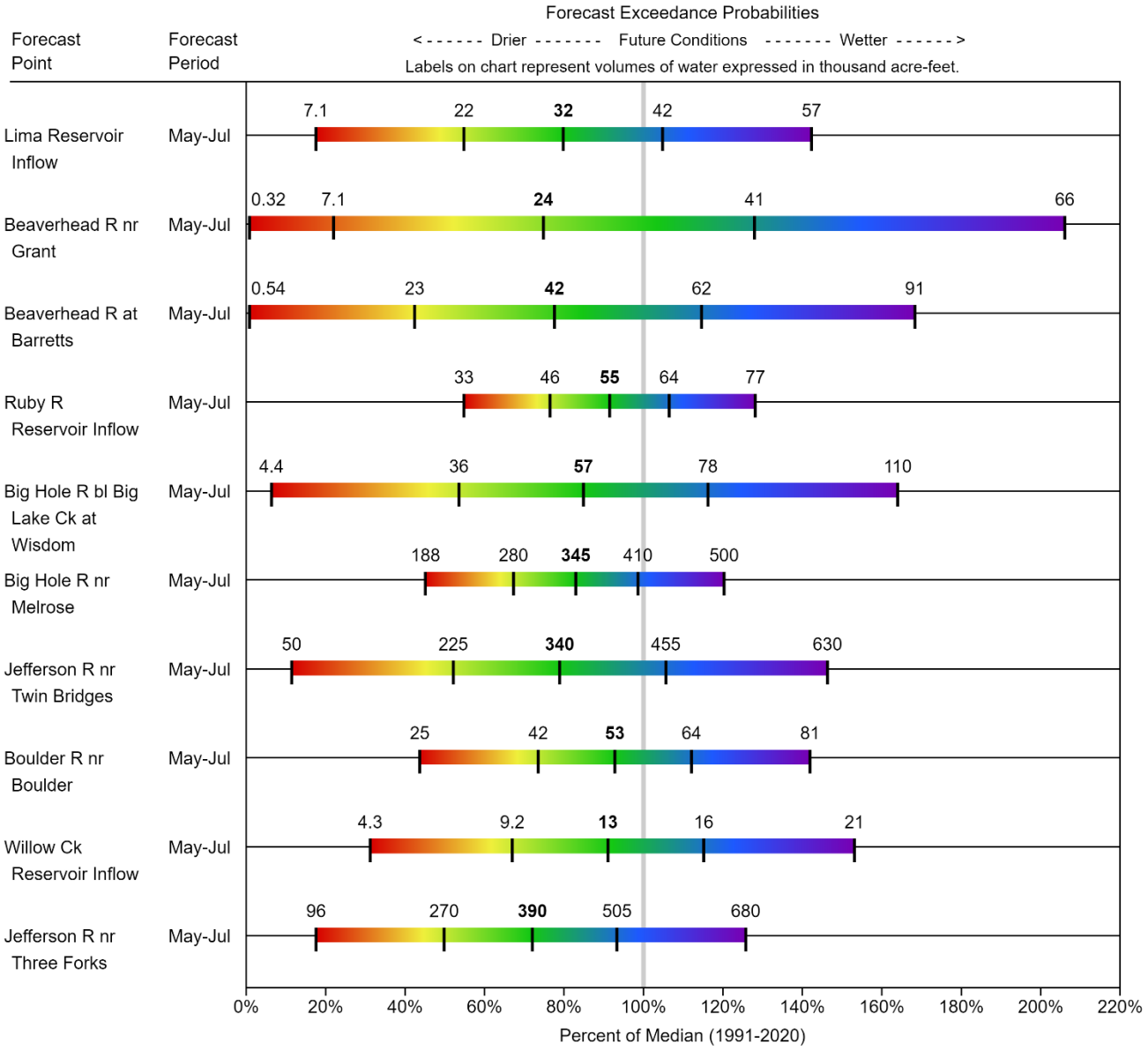
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

JEFFERSON RIVER BASIN

Water Supply Forecasts

May 1, 2022



Legend

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When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)	*1991-2020 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

MADISON RIVER BASIN

Water Supply Forecasts

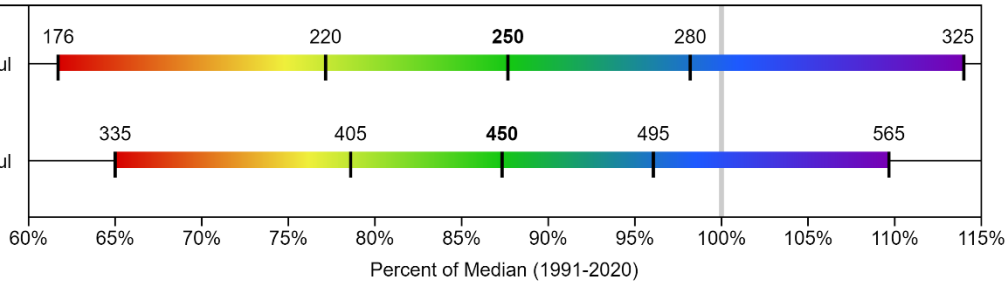
May 1, 2022

Forecast Exceedance Probabilities

< - - - - - - Drier - - - - - - - Future Conditions - - - - - - - Wetter - - - - - - >

Labels on chart represent volumes of water expressed in thousand acre-feet.

Forecast Point	Forecast Period	95% or 90% Exceedance	70% Exceedance	**50% Exceedance**	30% Exceedance	10% or 5% Exceedance
Hebgen Lake Inflow	May-Jul	176	220	**250**	280	325
Ennis Lake Inflow	May-Jul	335	405	**450**	495	565



Legend

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When selected, the following historic streamflow values and statistics will be shown.

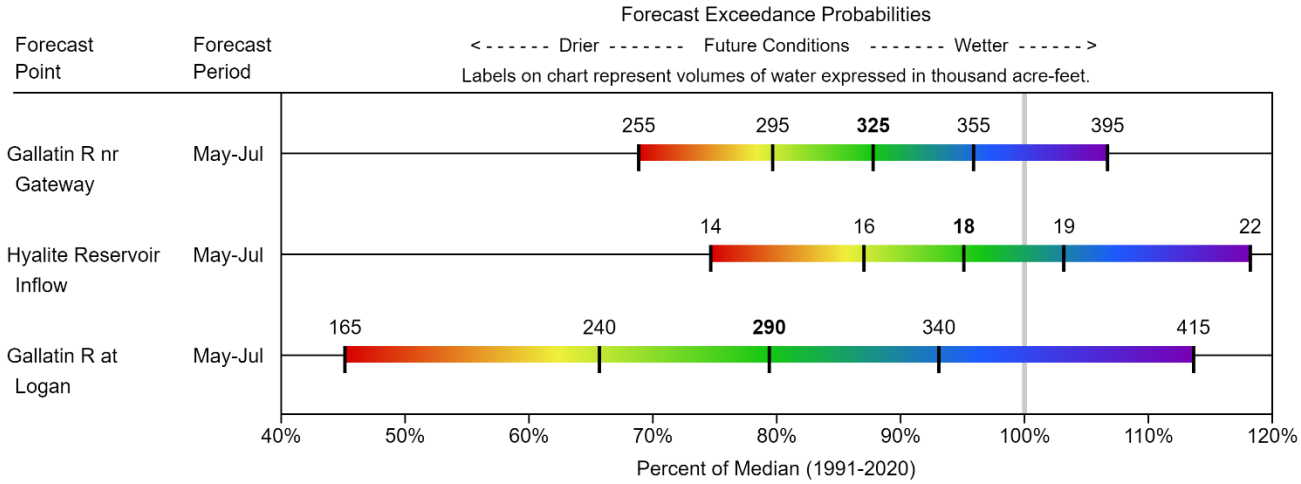
Period of Record Minimum Streamflow KAF (Year)	*1991-2020 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

GALLATIN RIVER BASIN

Water Supply Forecasts

May 1, 2022



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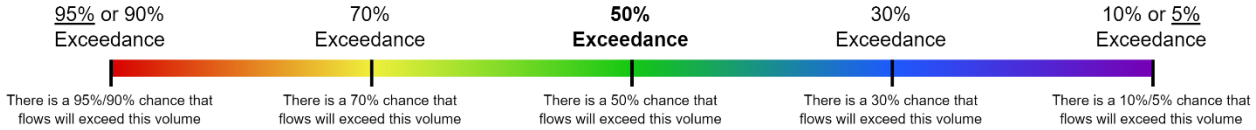


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

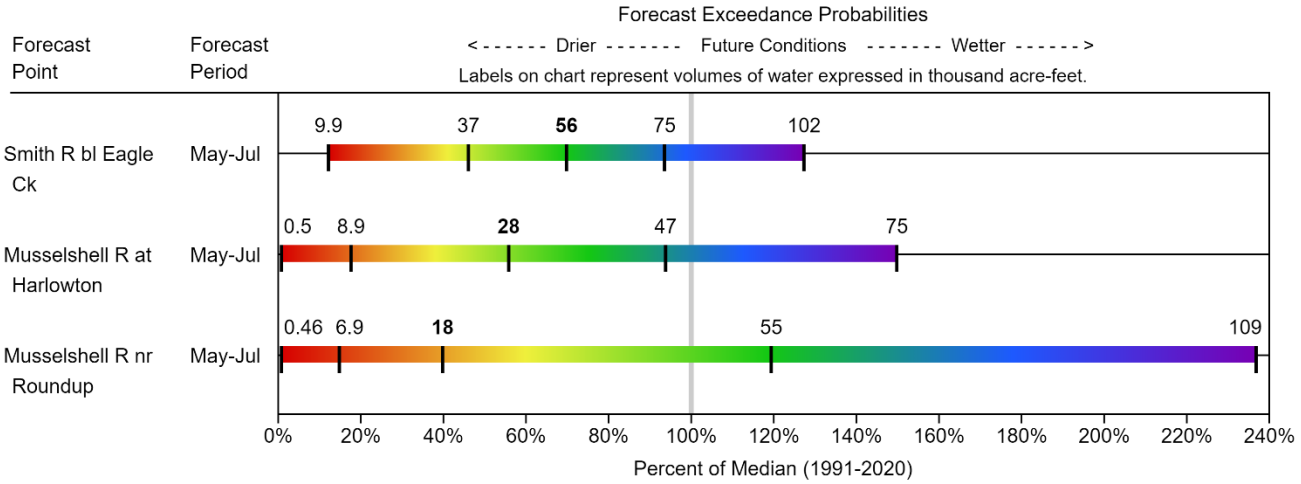
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

SMITH-JUDITH-MUSSELSHELL

Water Supply Forecasts

May 1, 2022



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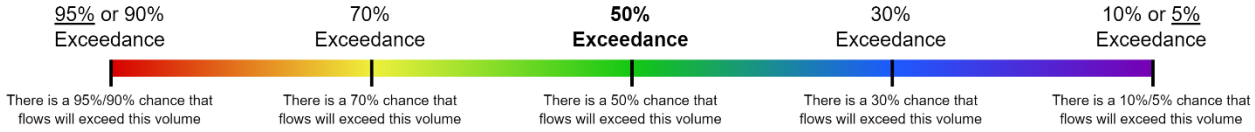


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

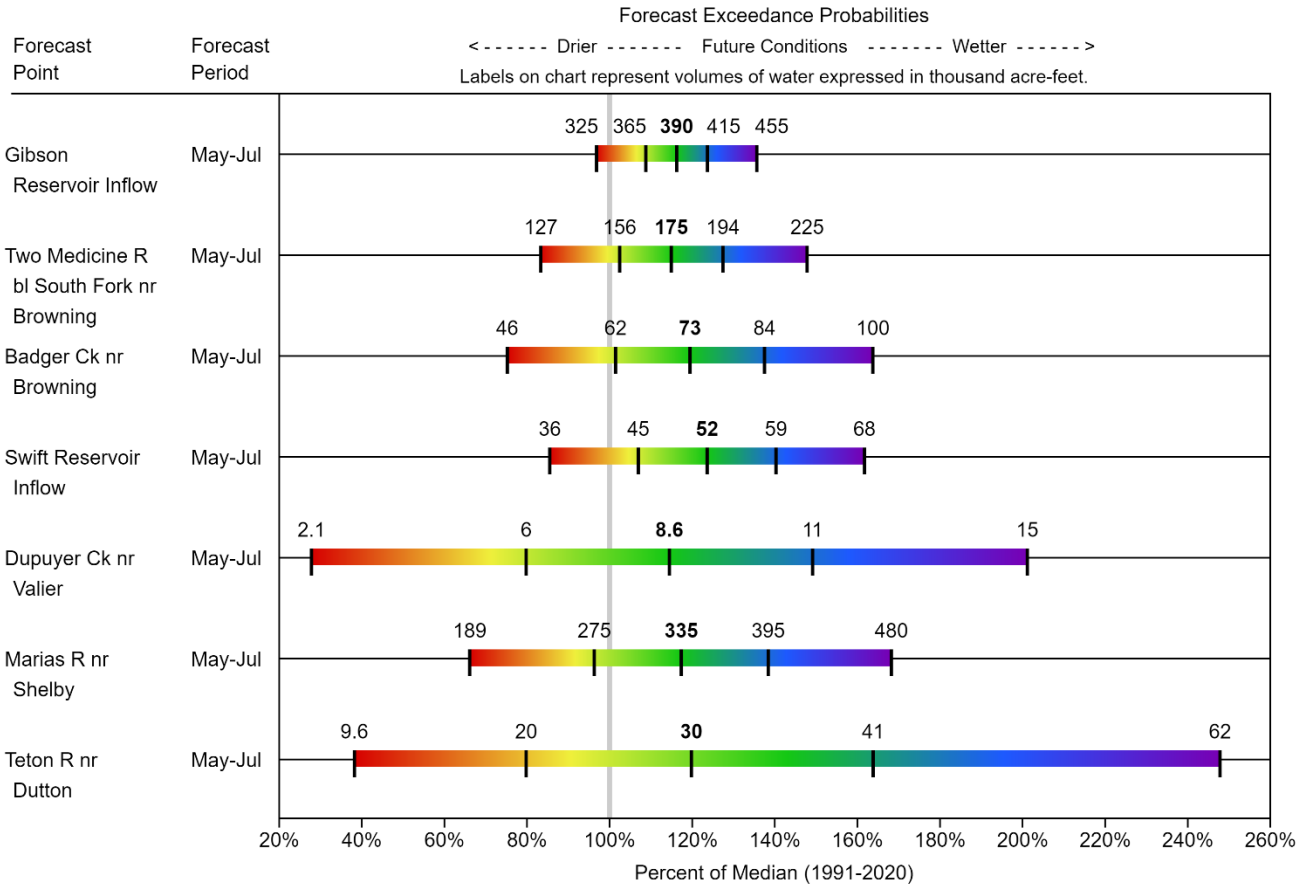
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

SUN-TETON-MARIAS

Water Supply Forecasts

May 1, 2022



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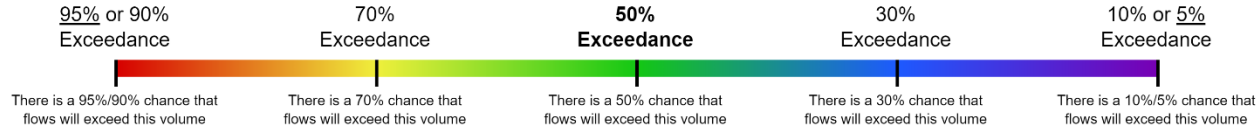


When selected, the following historic streamflow values and statistics will be shown.

Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

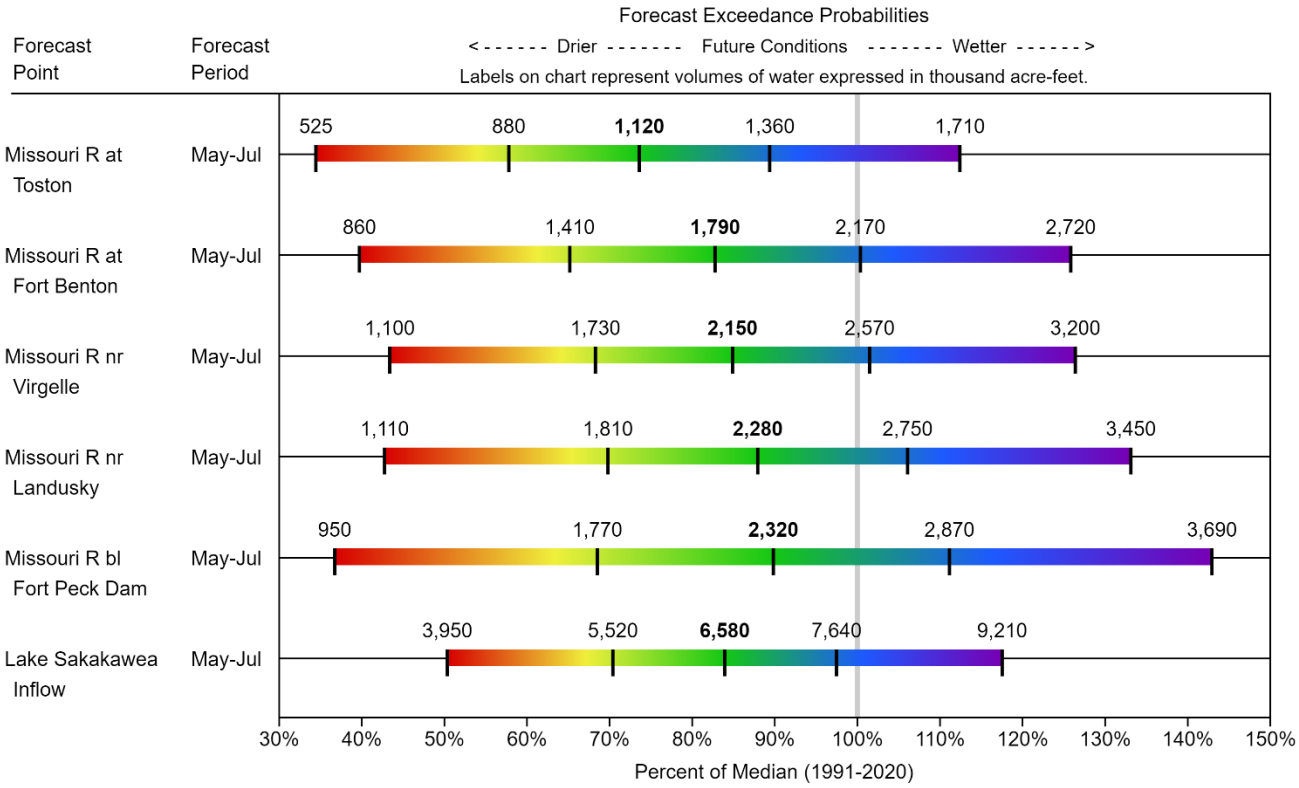
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

MISSOURI MAINSTEM BASIN

Water Supply Forecasts

May 1, 2022



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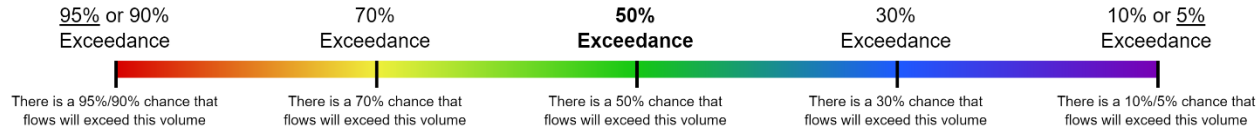

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1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

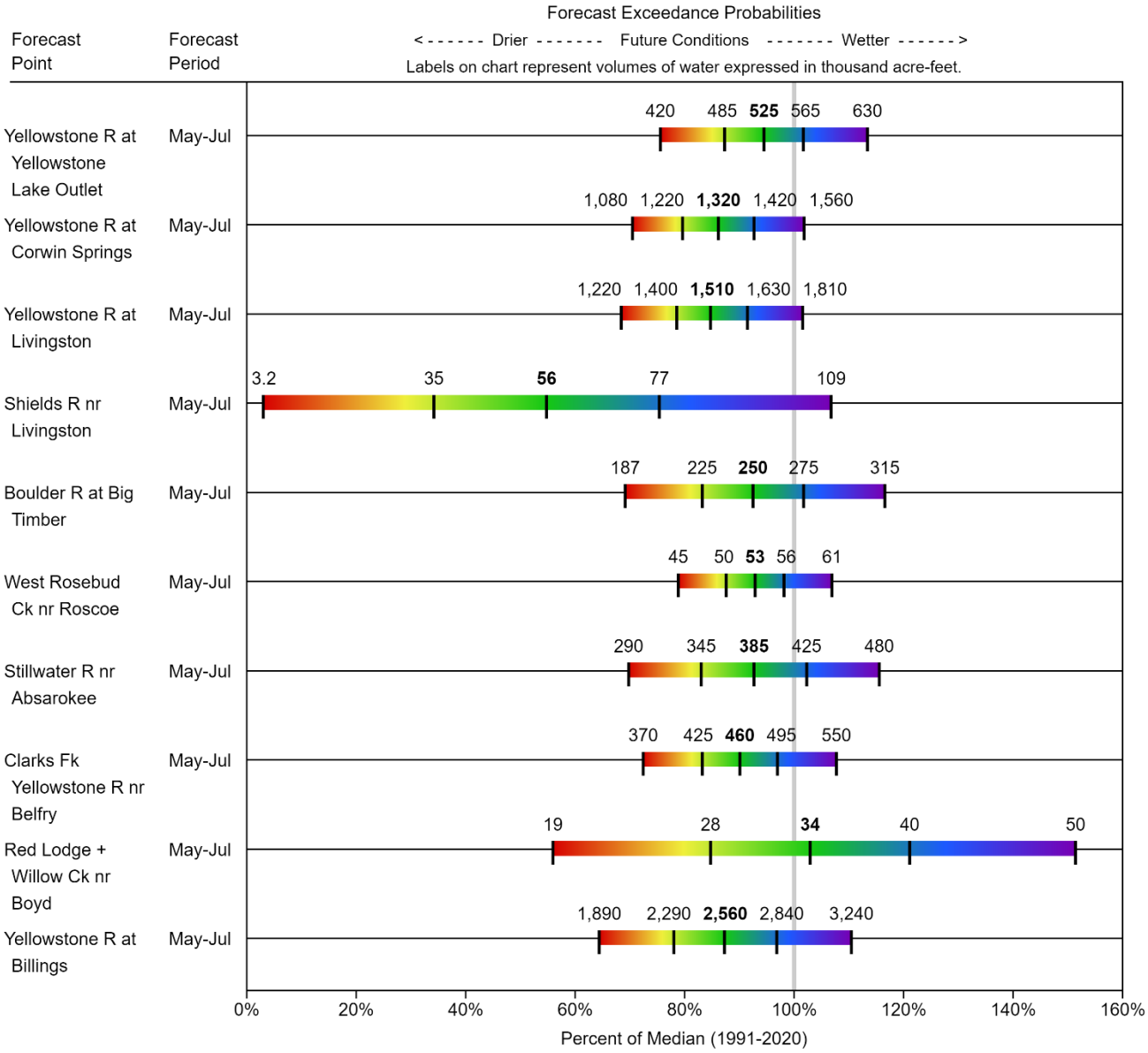
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

UPPER YELLOWSTONE RIVER BASIN

Water Supply Forecasts

May 1, 2022



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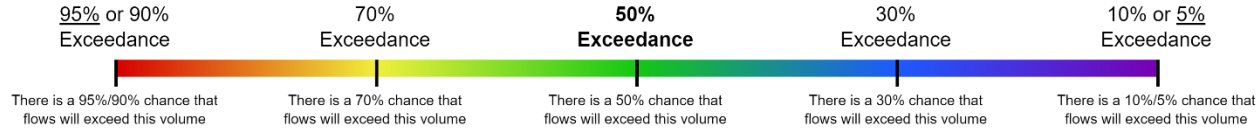

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Period of Record Minimum Streamflow KAF (Year)

1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

LOWER YELLOWSTONE RIVER BASIN (Wyoming)

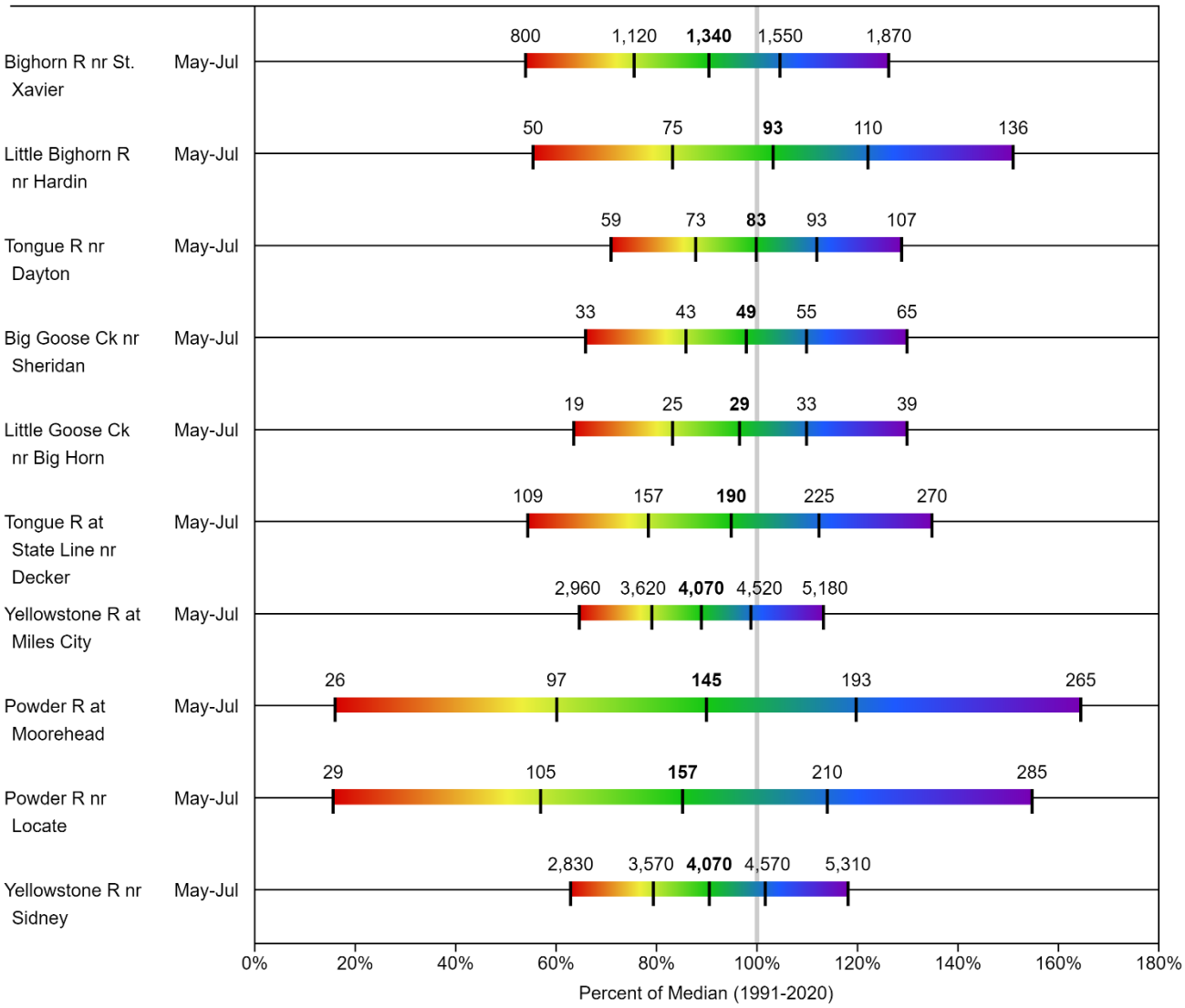
Water Supply Forecasts

May 1, 2022

Forecast Exceedance Probabilities

< - - - - - - Drier - - - - - - - Future Conditions - - - - - - - Wetter - - - - - - >

Labels on chart represent volumes of water expressed in thousand acre-feet.



Legend

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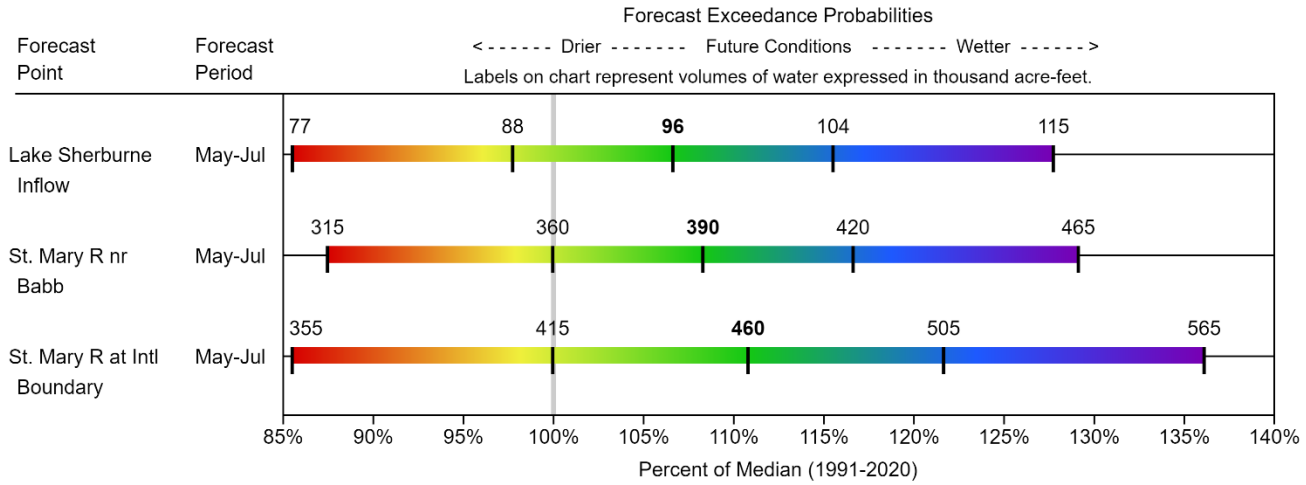
Period of Record Minimum Streamflow KAF (Year)	*1991-2020 Normal Streamflow KAF*	*Observed Streamflow KAF*	*Period of Record Maximum Streamflow KAF (Year)*

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

ST. MARY & MILK BASINS

Water Supply Forecasts

May 1, 2022



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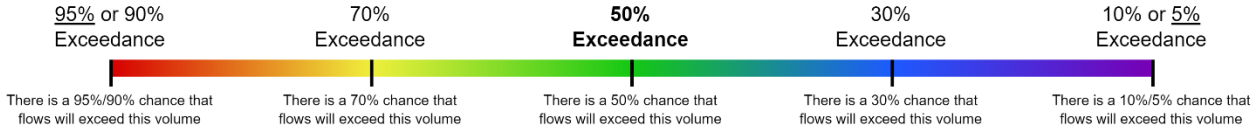

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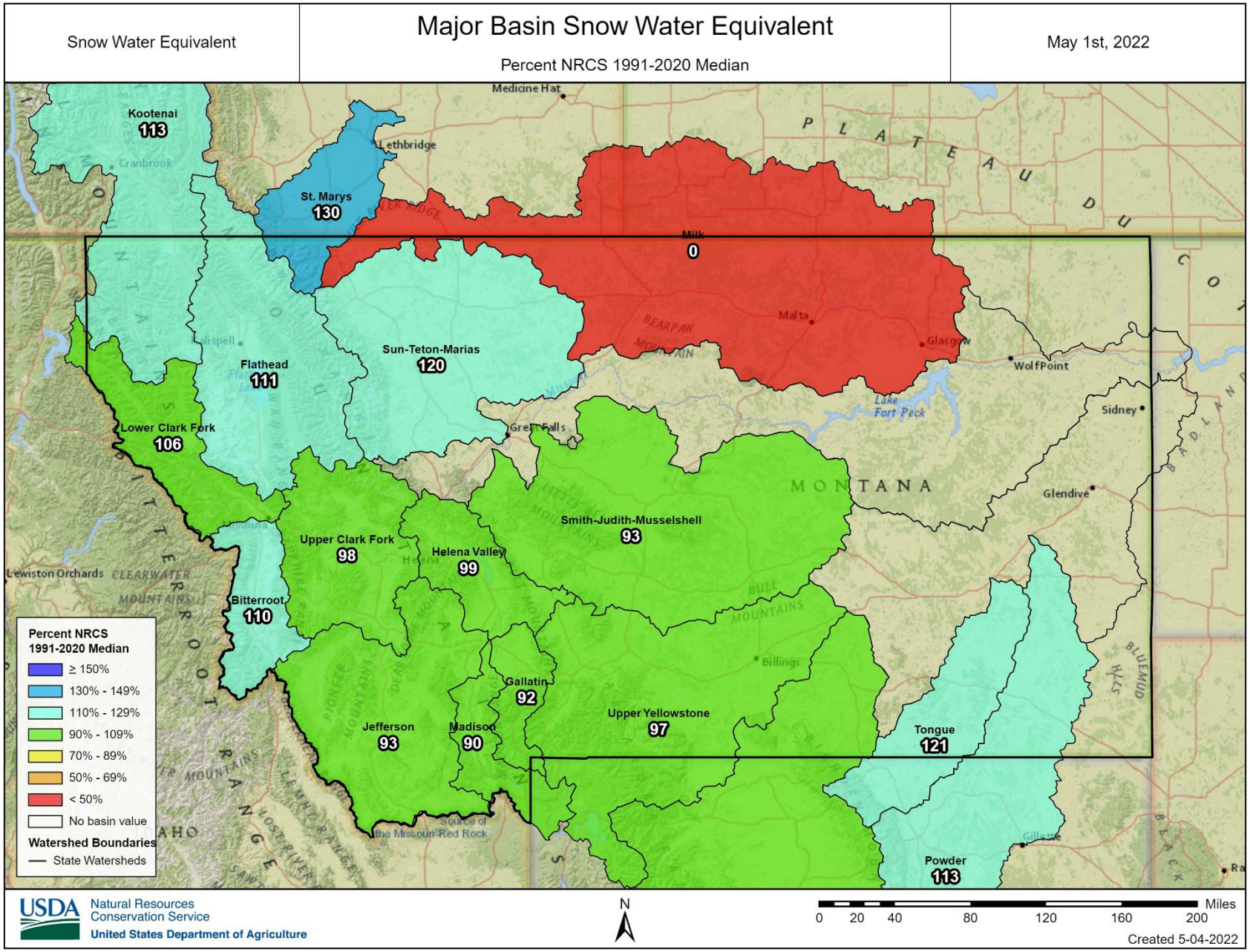
1991-2020 Normal Streamflow KAF

Observed Streamflow KAF

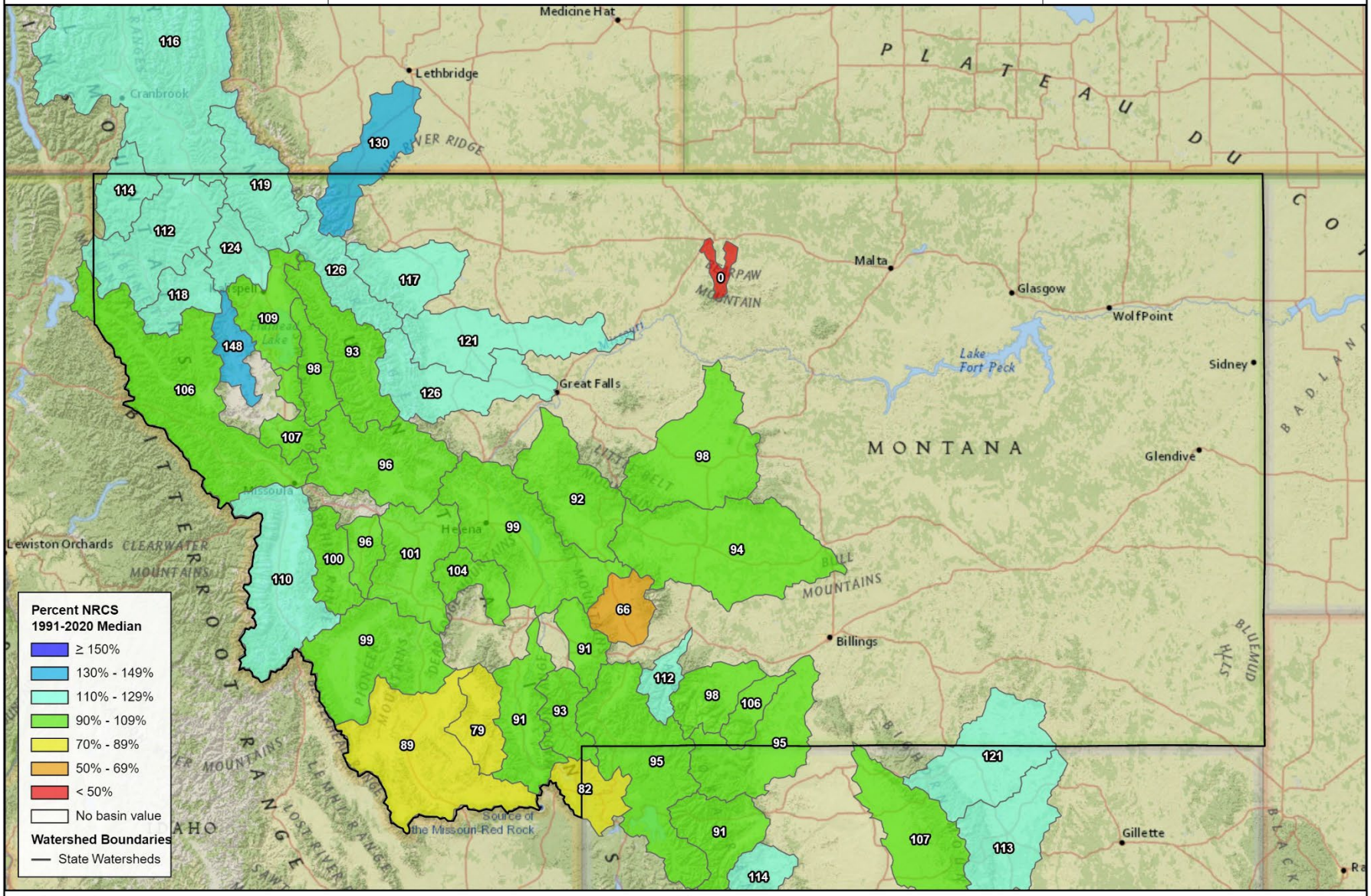
Period of Record Maximum Streamflow KAF (Year)

Some forecasts may be for volumes that are regulated or influenced by diversions and water management.

Maps


Snow Water Equivalent
Major Basin Snow Water Equivalent
Percent NRCS 1991-2020 Median
May 1st, 2022
Kootenai 113
St. Marys 130
Milk 0
Sun-Teton-Marias 120
Flathead 111
Lower Clark Fork 106
Upper Clark Fork 98
Helena Valley 99
Smith-Judith-Musselshell 93
Bitterroot 110
Gallatin 92
Jefferson 93
Madison 90
Upper Yellowstone 97
Tongue 121
Powder 113
Percent NRCS 1991-2020 Median
≥ 150%
130% - 149%
110% - 129%
90% - 109%
70% - 89%
50% - 69%
< 50%
No basin value
Watershed Boundaries
State Watersheds
USDA Natural Resources Conservation Service
United States Department of Agriculture
N
0 20 40 80 120 160 200 Miles
Created 5-04-2022

Snow Water Equivalent	Sub-Basin Snow Water Equivalent Percent NRCS 1991-2020 Median	May 1st, 2022



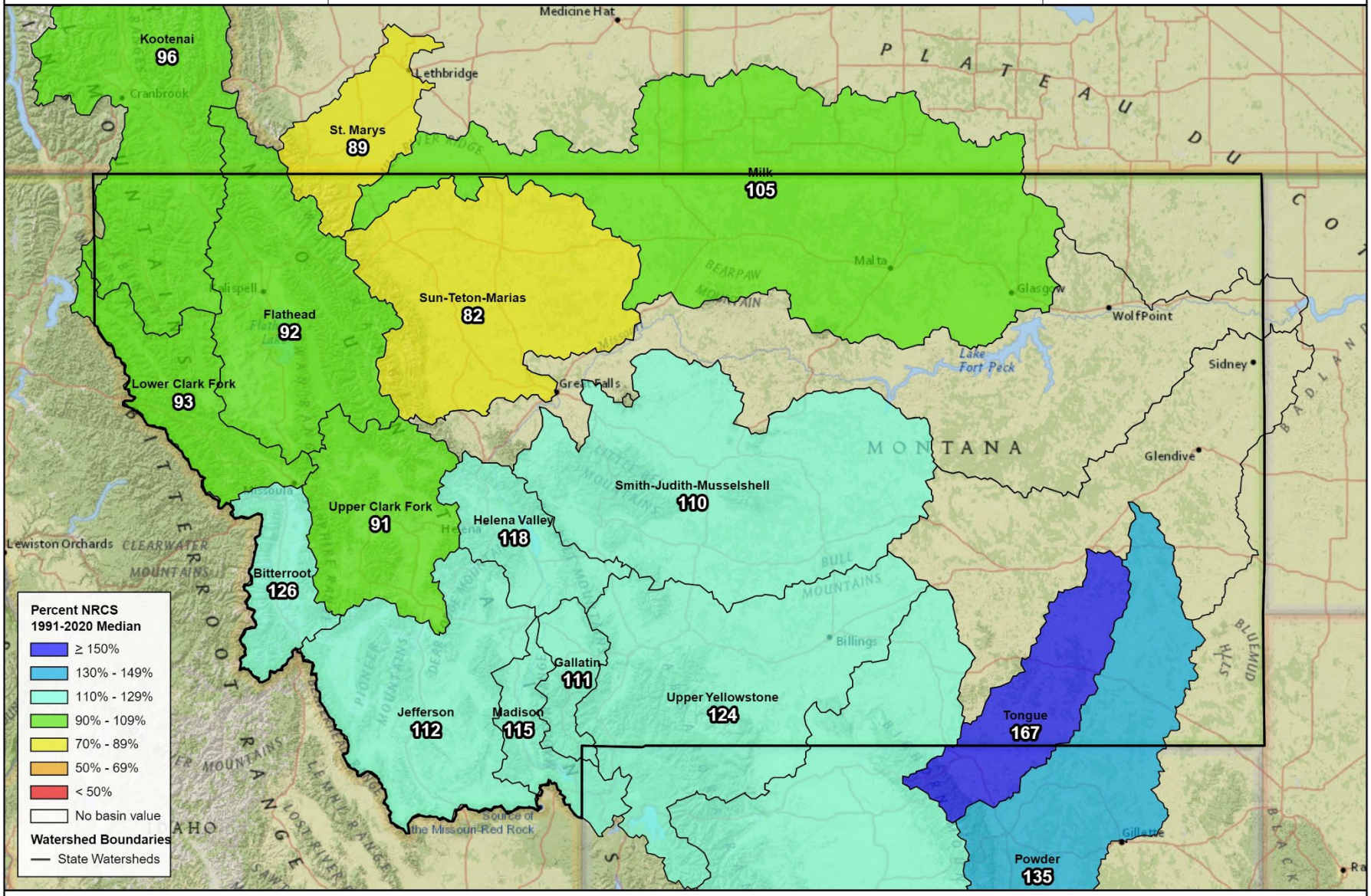
USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 5-04-2022

1 month Precipitation	Monthly Precipitation Percent NRCS 1991-2020 Median	April 1, 2022 - April 30, 2022



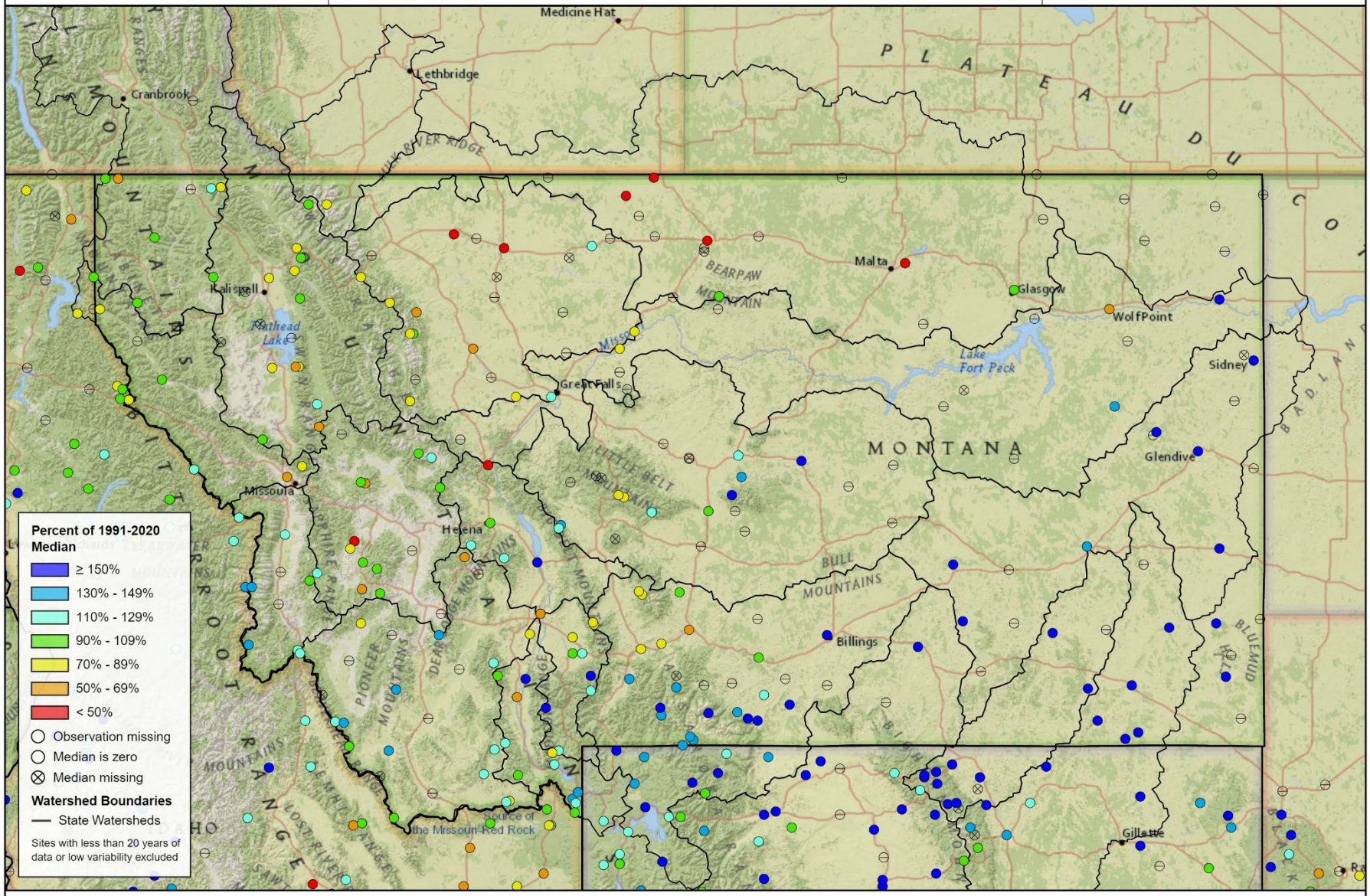
USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

Created 5-04-2022

1 month Precipitation	Monthly Precipitation Percent of 1991-2020 Median	April 1, 2022 - April 30, 2022



USDA Natural Resources Conservation Service
United States Department of Agriculture

N

0 20 40 80 120 160 200 Miles

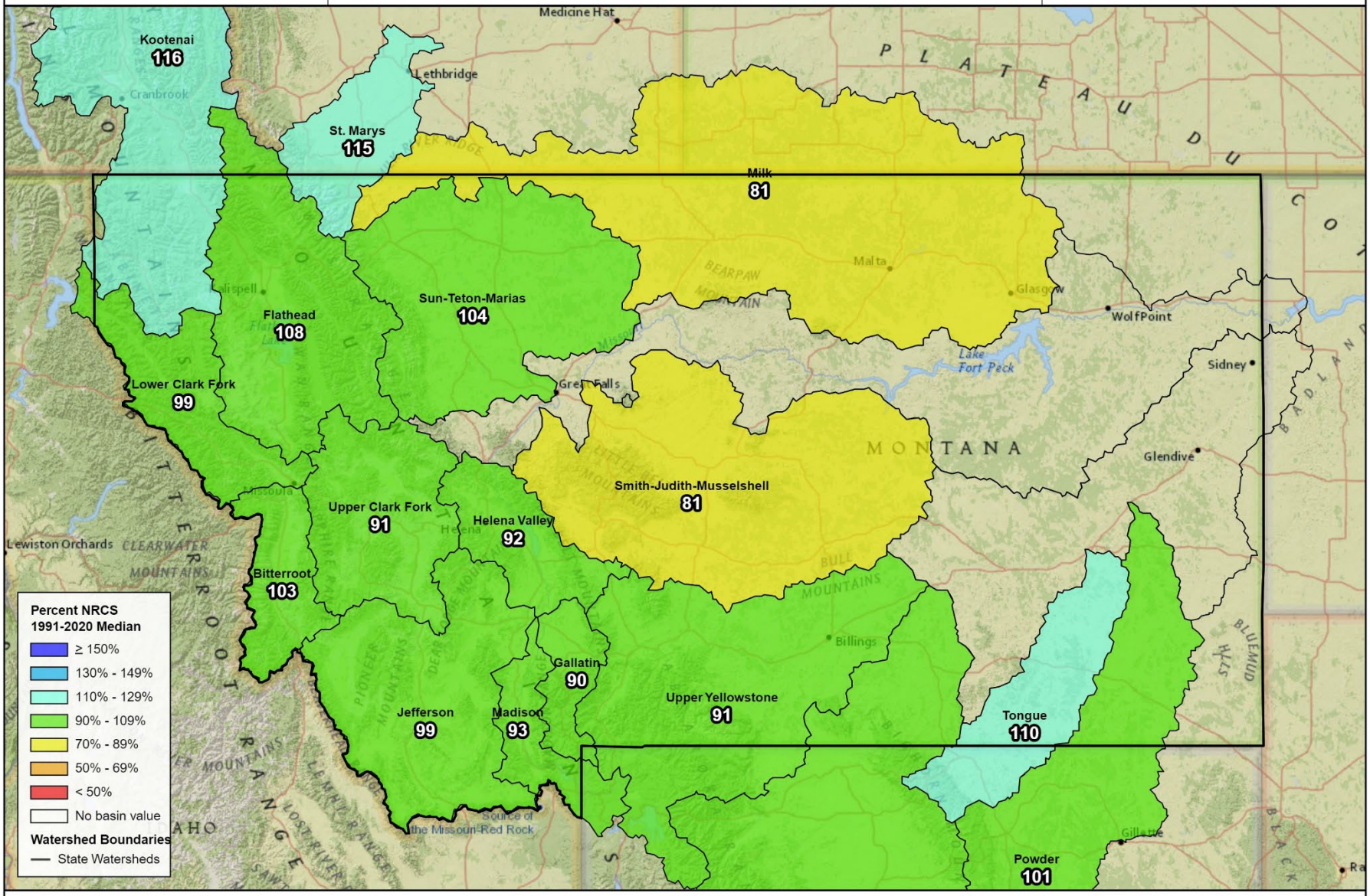
Created 5-04-2022

Water Year to Date Precipitation

Water Year Precipitation

Percent NRCS 1991-2020 Median

October 1, 2021 - April 30, 2022



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N

0 20 40 80 120 160 200 Miles

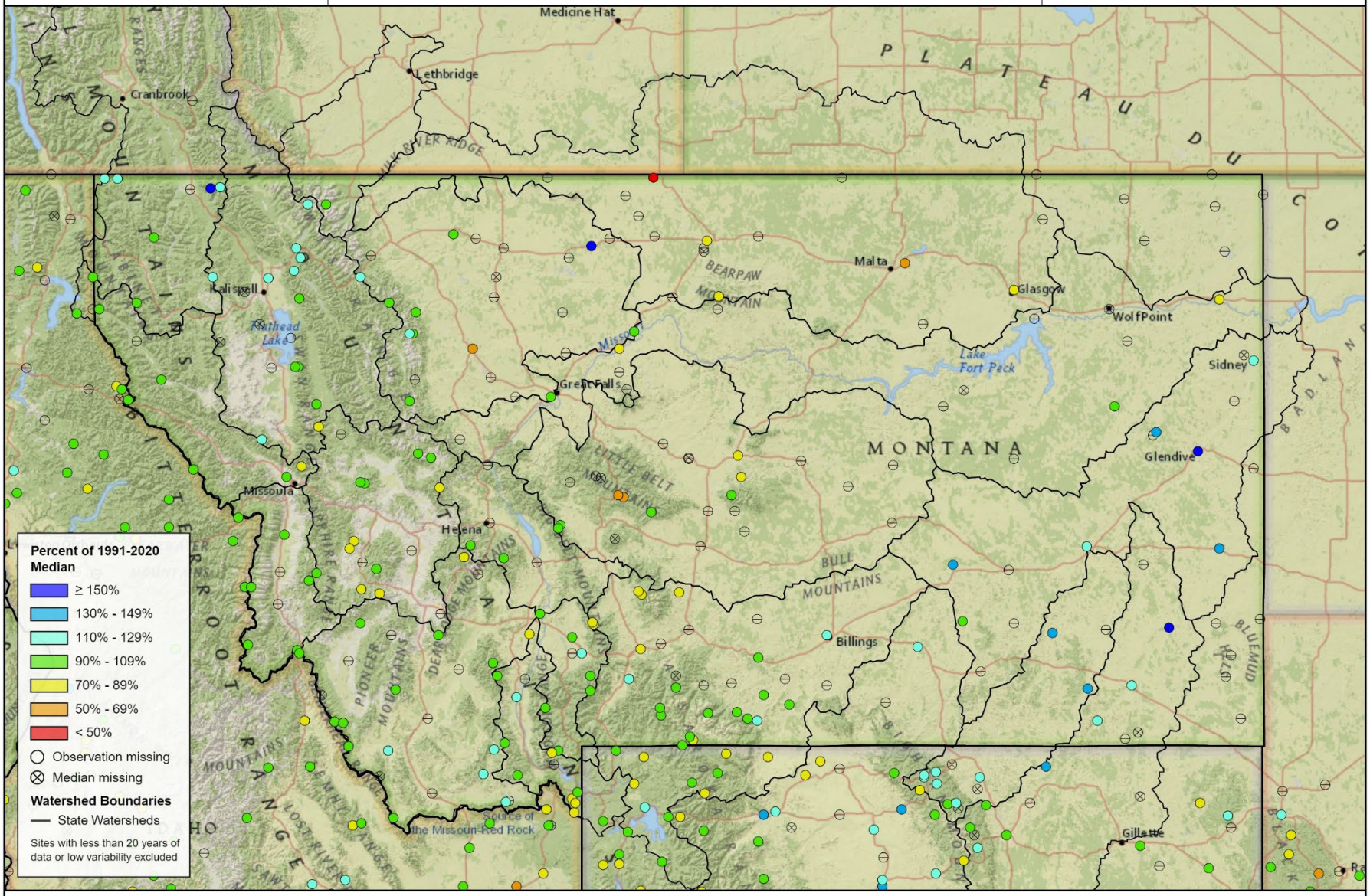
Created 5-04-2022

Water Year to Date Precipitation

Water Year Precipitation

Percent of 1991-2020 Median

October 1, 2021 - April 30, 2022



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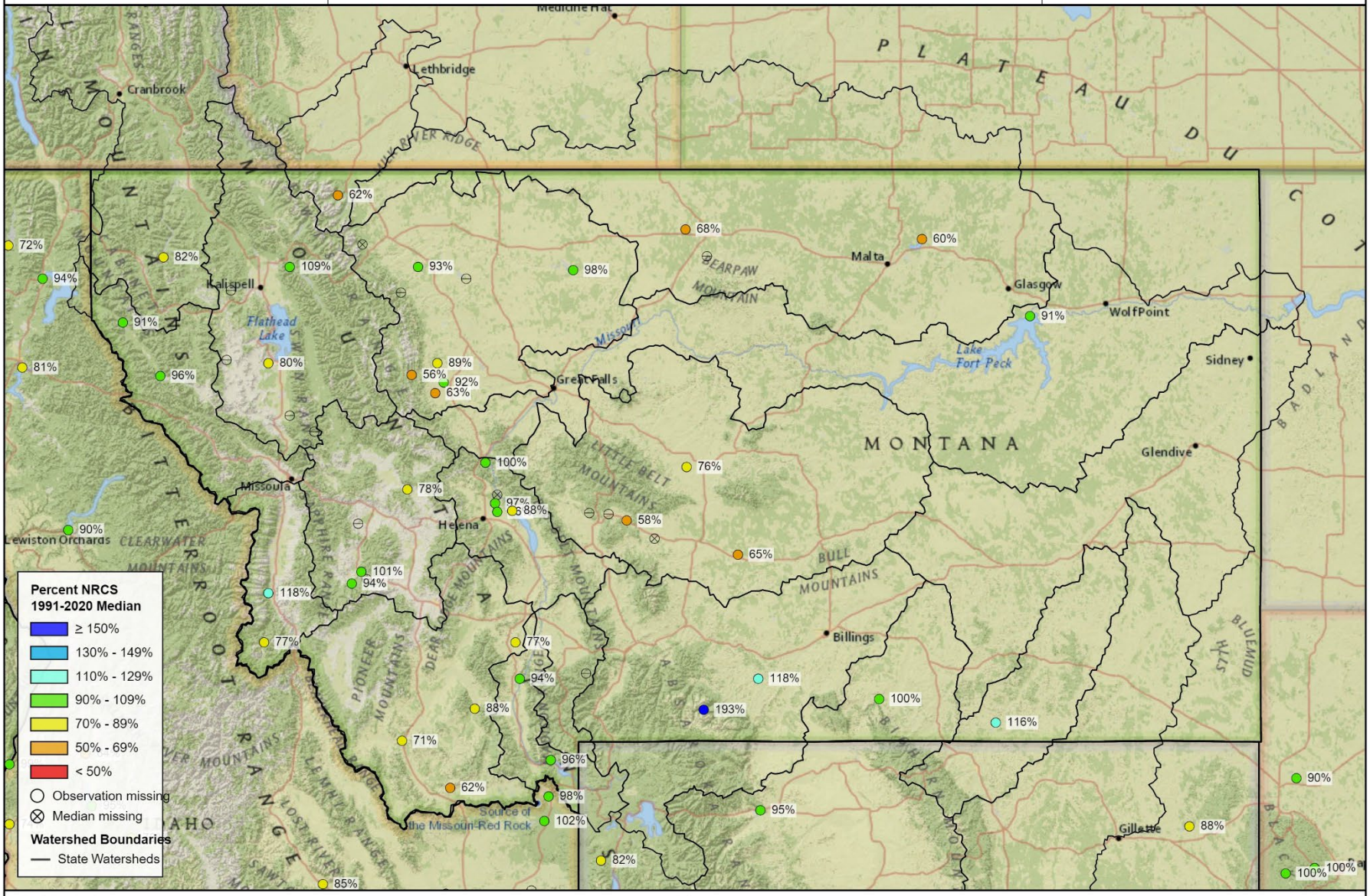
N

0 20 40 80 120 160 200 Miles

Created 5-04-2022

Reservoir Storage	Reservoir Storage Percent NRCS 1991-2020 Median	May 1st, 2022



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N

0 20 40 80 120 160 200 Miles

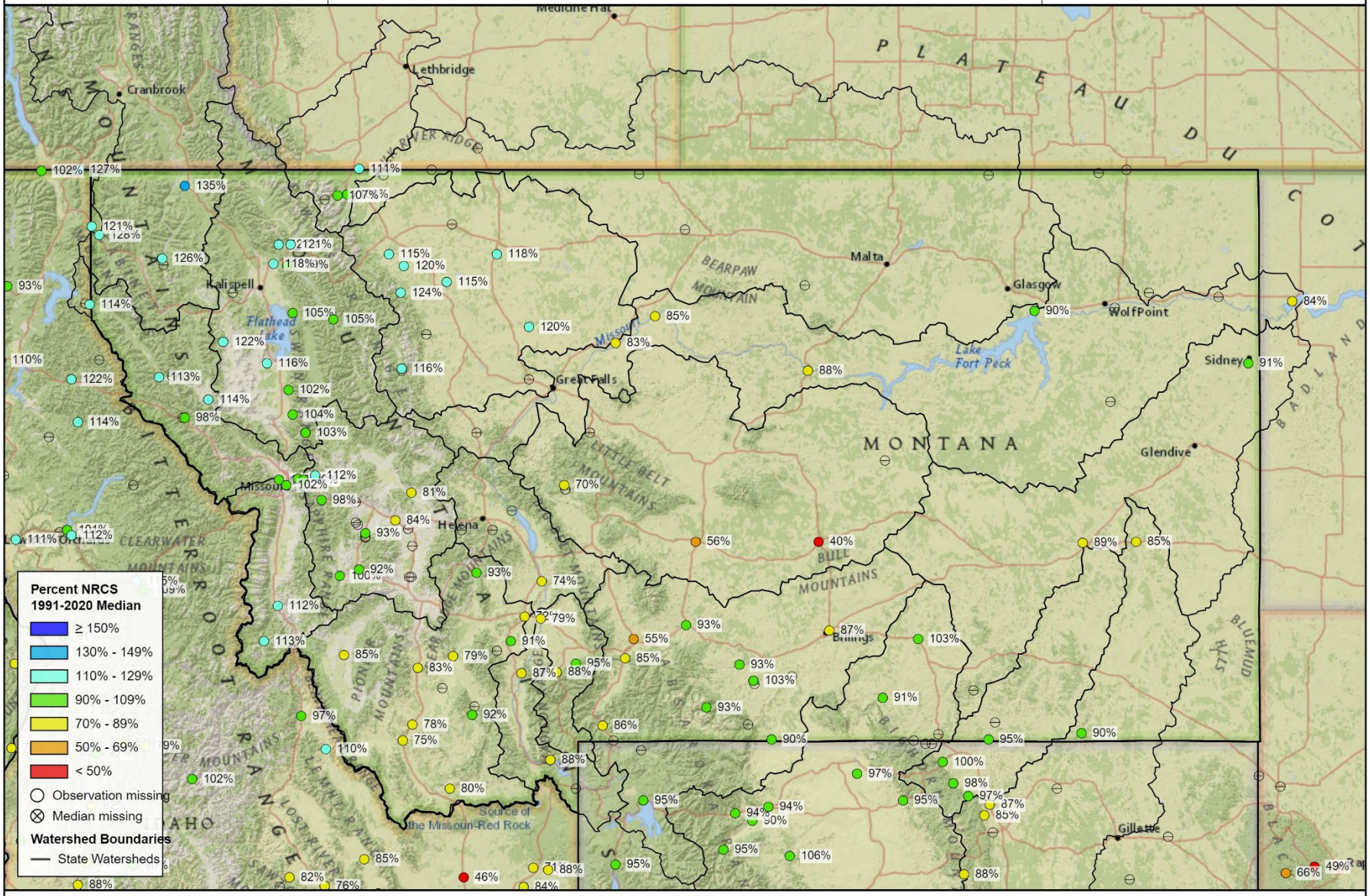
Created 5-06-2022

Forecast Volume,
50% Exceedance Probability

Streamflow Forecasts: May 1st - July 31st, 2022

Percent NRCS 1991-2020 Median

May - July, May 1, 2022



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N

0 20 40 80 120 160 200 Miles

Created 5-06-2022

WSOR Web Page Access

The links below will take you to web pages dedicated to the individual river basins and statewide overview for presenting the monthly data. Users are encouraged to interact with the maps presented, select different maps using the drop-down menu, and hover over or click on points or basins of interest to view data and plots.

Monthly Data - Interactive Web Pages		
Monthly Data - Statewide Overview		
Monthly Statewide Overview		
Monthly Data - River Basin Summaries		
Columbia River Basin	**Missouri River Basin**	**Yellowstone River Basin**
Kootenai	**Jefferson**	**U. Yellowstone**
Flathead	**Madison**	**Wyoming**
Upper Clark	**Gallatin**	
Bitterroot	**Helena Valley**	
Lower Clark	**Smith-Judith**	
	Sun-Teton	
	St. Mary	
	Milk	

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Montana Water Supply Outlook Report

Natural Resources Conservation Service